HEALTHY POLICY, HEALTHY BABIES: THE USE OF THE BOX-JENKINS ARIMA TIME SERIES ANALYSIS TO DETERMINE LEVELS OF SUCCESS IN FLORIDA'S HEALTHY START PROGRAM

By

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Within the study of public policy implementation are the principles that the success or failure of a policy is never a given and that it is difficult, if not impossible, to causally link the actions of various actors in the process of implementation to a particular outcome.

This research examines the Florida Healthy Start program in order to determine if the program made a significant impact on its outcome objectives. The study used a combination of Box-Jenkins autoregressive integrated moving average (ARIMA) time series analysis of monthly low birthweight rates in Florida between January 1988 through December 1996, and a qualitative telephone survey of experts in the Healthy Start program. The results of the ARIMA time-series analysis indicate that an intervention impact resulting from the implementation of the Healthy Start program in 1992 could not

be determined, apparently indicating that the program has not had an impact on low birthweight birth rates in Florida. In addition, the studies found that although the coalitions are a combination of rural and urban counties across the state, the implementation of the Healthy Start program has been very similar across coalitions. In conclusion, the methodology allows researchers to directly examine if a public health program has the ability to impact a target population, beyond the larger trend of change that would otherwise be present. These findings add to the policy innovation, policy implementation, and medical literature in several ways.

Additional research in this area might compare the impact of Florida's maternal and infant care programs to that of other state programs, or similar programs administered at the federal level. Research may also, and should, be conducted on the cause behind the consistent seasonal pattern of low birthweight births in nonwhite women in Florida. This research should determine if the seasonal pattern is unique to Florida's nonwhite population; whether the pattern is consistent over a larger span of years; and whether the cause of the seasonality is biological, environmental, or a result of the predominant use of the public health care system in Florida by nonwhite women for accessing perinatal health care.

CHAPTER 1
INTRODUCTION

In the federalist system of the United States, the states are increasingly responding to social crises within their jurisdictions by implementing their own innovative policies, rather than waiting for federal intervention. This is occurring because, in general, states have undergone significant changes in their institutions allowing for greater representation of new ideas which, in turn, have led to a greater willingness to pursue new policies (Bowman and Kearney, 1986; Van Horn, 1993; Hedge, 1998). In terms of health policy, states have truly served as "laboratories of democracy" by their testing of new approaches to solving health problems and "highlighting consequences [of these innovations] before national imposition" (Weissert and Weissert, 1996). Specifically, the states have introduced many health policy reforms over the past twenty years including providing universal health coverage, reforming small-group health insurance markets, and creating new programs to address serious public health concerns (e.g., AIDS, low birthweight births and the resulting infant mortality) (Weissert and Weissert, 1996; Leichter, 1997).

While there is agreement that the states have become more active in creating new polices, the question still remains whether they can effectively and efficiently implement these polices. Gauging a state's ability to implement a particular health policy or program has proven problematic. Additionally, determining whether the states are better

able to accomplish the goals of these innovative policies than the federal government has not been proven conclusively. Within the study of public policy implementation are the principles that the success or failure of a policy is never a given and that it is difficult, if not impossible, to causally link the actions of various actors in the process of implementation to a particular outcome (Scheirer and Griffith, 1990). For this reason, some of the most significant divisions in the literature on implementation remain: (1) trying to determine which factors most directly impact implementation; and (2) whether the causal link between a program's outputs and outcomes can be established. In the end, the inability to develop an *empirical* research model that can explain success or failure of public policy in non-anecdotal terms (i.e., not case studies), and the ability to link implementation outputs to outcomes has proven elusive (Goggin, 1986; Younis, 1990; Lester, et al., 1987). The shortcomings in the research literature present problems for the policy and political science fields, as well as for policymakers who need to understand why programs succeed or fail.

In light of these continuing problems, this analysis attempts to determine whether the Florida Healthy Start program has made an impact on the stated program goal (outcome) of reducing low birthweight rates. Specifically, the purpose of this dissertation will be to determine three things:

1. Has there been a change in low birthweight rates within the target population in the state of Florida, as a whole, since the introduction of the Healthy Start program? And if so, what has been the impact?

2. Are there differences in the way the Healthy Start program has been implemented among the programs' administrative regions (coalitions)?

3. Have any identified differences in implementation had a significantly different impact on reducing low birthweight rates in the target population?

This study is divided into several chapters. Chapter 2 is a literature review that examines policy innovations within the states; the role of health policy analysis and assessment in state policy innovation; implementation factors that may explain the success or failure of the implementation of a public policy; the problem of low birthweight births in the U.S.; and the federal and state programs created to address the issue. Chapter 3 examines the impact of Florida's Healthy Start program at the state level using the Box-Jenkins ARIMA time series analysis methodology. Chapter 4 examines the impact of the Healthy Start program at the substate (coalition) level to determine if differences in policy implementation would demonstrate any change in low birthweight births within those substate areas. The final chapter discusses the research findings and their implications for determining why public policies and programs often fail to succeed to meet their stated goals.

CHAPTER 2
REVIEW OF LITERATURE

This chapter is a review of the literature pertaining to policy innovation in the states; factors that impact the implementation of public policies and programs; and the incidence and causes of low birthweight births, as well as the interventions that have been tried to reduce the problem. The goals of this chapter are: (1) to demonstrate why it is important to focus on health policy at the state level; (2) to describe some of the implementation factors which may be important determinants of whether a program succeeds or fails; and (3) to educate the reader of the problem of low birthweight births in the U.S. and Florida; and (4) to describe how this problem has been addressed both nationally and at the state level.

Policy Evaluation as an Administrative and Political Tool

If politics is society's chosen method of allocating benefits among its citizens within the context of legal powers (Easton, 1953), then public policy is the primary tool of the political process. Policy is the expression of the body politic and is used to direct the allocation of resources through various programs. In this process, interested parties attempt to influence the allocation of these resources based on their interpretation of what is "good" public policy. By the nature of the process, there are invariably "losers" and "winners," and each will need to support their respective position on a given policy issue.

Because the establishment and continuous functioning of a public program is a constant reminder of the choice that was made regarding the allocation of society's resources, the ability of a public program to address a policy issue will be constantly scrutinized by both advocates and opponents. One tool that is used by both sides of an issue is a policy evaluation. Advocates evaluate the program's success so that they can argue for continued, or increased, funding during future budgetary cycles, while opponents evaluate a program in order to lobby for the end of the program, or for significant modifications to its operation. Additionally, an administrator may evaluate a program in order to determine whether it works and for whom, or to determine the priority the policy should receive among competing programs. For all of these reasons, policy evaluation is often a political tool that is frequently used by various interest in the policy debate to support their particular view.

However, there are several problems that hinder interested parties from using policy evaluations to determine whether a program has been successful and whether it should be continued. In the United States, the policy process is complicated because the allocation of resources takes place at all levels of our federalist system. As described by Anton, "[t]he American system of federal governance, then, is one in which several levels of government typically share responsibility for policy and administration -- and often funding as well" (1997, p. 701). Whether a particular policy issue is more appropriately administered at the federal or the state level is, itself, a constant area of debate in political science and society. Another problem with examining public programs to determine if they have had the desired effect (and to see if the allocation of society's resources are

appropriate), is that it is still not certain what implementation factors may improve the chances of success and which factors may doom the program to failure.

Health policy is an issue that clearly reflects these struggles. While most areas of health care and health policy have traditionally been addressed at the local level, certain societal desires have created a role for the federal government in the delivery of health care (e.g., Medicare, Medicaid, Clinton's health care reform debate in 1993). At the same time, it is not known conclusively which factors most directly impact successful implementation. As society increases the debate on whether health care is better administered at the federal or state level, the ability to understand whether a particular program can have an impact on health care issues and which factors are key for their success will become more important.

Policy Innovation in the States

The role of the states in developing policies in the American federalist system began to receive considerable attention during the 1980s. As the Reagan Administration launched its "deevolution" initiatives, critics of his policies began to ask whether the states had the ability to handle the social and economic problems that were being shifted to state responsibility. In Bowman and Kearney's, *The Resurgence of the States* (1986), the authors argue that during the late 1970s and the early 1980s, the states became revitalized actors within the federalist system. They go on to suggest that this revitalization has produced innovative policy in a number of areas (i.e., economic development, education, and the environment). In order to better understand this resurgence, it is necessary to look at the conditions of the states prior to Bowman and Kearney's research.

The original role of the federal government was primarily one of providing common defense, protecting against barriers to interstate commerce, conducting foreign affairs, and regulating territorial expansion (Bowman and Kearney, 1986). All other functions were left to the states and this state-dominated federalism continued until the turn of the twentieth century. This system went through a significant transformation after the stock market crash of 1929. States were unable to handle the social and economic problems that they faced and so they abdicated many of their policy powers to Washington. The result was a federally dominated system of federalism.

What did the states look like during this time? Terry Sanford described the condition of the pre-reform states in his book, *Storm Over the States* in 1967 (most of the reforms in the states took place after 1965) (Gray and Eisinger, 1991). He opens his book with a list of the charges against the states including that they were indecisive, antiquated, timid, ineffective, not willing to face their problems, and not interested in cities. Governors were seen as "Good-time Charlies" with few institutional abilities or responsibilities (a feature that had existed from post-Revolutionary times, although some reforms had begun around the turn of the century) (Sabato, 1983), legislatures were often seen as corrupt institutions where “good-ol'-boy-politics” reigned (Bowman and Kearney, 1986), party competition in many states was non-existent, and executive agencies were “bastions of mediocrity” (A.C.I.R., 1985). Sanford concluded his book with a list of reforms that could have been the blueprint for the reforms to come.

Bowman and Kearney's argument suggests that the states have developed over the last thirty years to a point that they should no longer be seen as weak links in the federalist system. The authors describe a model of resurgence where the national government

became unwilling or unable to deal with many of the local social problems. In turn, state governments, which had undergone various capacity building reforms, were able to reclaim the policy powers that they had abdicated during the New Deal era. The authors concluded that these reforms have moved the country away from nation-centered federalism back towards federalism where states are on a more equal footing.

How has this model of resurgence held up and why we would expect it to change in such a short period of time? To answer the second part of this question first, Bowman and Kearney offered three factors that could slow, or reverse, this resurgence. Among these three factors, the authors stated that,"the spirit of state resurgence could again (and permanently) be dampened by worsening money problems unless federal, state, and local officials are able to confront head-on the need for restructuring intergovernmental financial relations" (1986, p. 35). Coming out of the recession of the late 1980s, it appeared that Bowman and Kearney's predictions may come true. In accessing the resurgence of the states in the early 1990s, Van Horn summed up the challenge to the resurgence model by saying, "the boom years of increasing state revenues were replaced by the gloomy years of budget deficits, tax increases, and program reduction. Federal officeholders passed the buck but not the bucks to handle a broad array of public problems. . .State officials and institutions now are being tested like never before" (1993, p. 2).

Is the resurgence model still valid? A review of the literature suggests that the model has held up rather well, although resurgence has slowed. Gray, Jacob, and Albritton (1990) provide evidence that the states not only were able to survive the decline in federal programs during the Reagan administration but also were able to continue or

expand many of the program. Furthermore, Gray and Eisinger (1991) note that even though the value of federal aid to the states fell 39% in the years between 1980 and 1987, the states have become more economically self-reliant. However, as the recession took hold in the early 1990's, states were forced to cut expenditures and increase taxes to offset the effects of the economy. The state resurgence slowed, but the federal government did not intervene as it had done in the past [Raimondo, 1993 (in Van Horn, 1993); Van Horn, 1993 (in Van Horn, 1993); Nathan, 1993 (in Van Horn, 1993)]. The net result was that the gains made by the states during the 1980's were not diminished relative to the power of the federal government. As we come out of the economic downturn, the states appear to have actually weathered the storm better than the federal government. Where the federal government increased the deficit in response to this problem (a situation that is prohibited at the state level), the states made tough policy choices and are now in the forefront of many of the policies on the national agenda.

Hedge (1998) finds significant evidence that the states have continued this resurgence well into the 1990s through both reforms on the demand-side and supply-side of state governments. The author examines the links between citizens and policymakers (the demand-side) and reforms that have impacted their interaction. These demand side reforms (i.e., reapportionment, civil rights policy, electoral reforms, the use of initiatives and referendum, interest group politics, and the resurgence of the political parties) have had a mainly positive impact on statehouse democracy, although there have been some negative consequences associated with the reforms. Likewise, Hedge finds a strengthening of the supply-side institutions (i.e., procedural, professional, demographic,

and administrative changes within the executive, legislative and judicial branches of state government) that have increased the ability of states to govern.

How has this shifting of policy innovation between the federal and state governments changed the basic responsibilities of each? This change can be demonstrated by examining the nature of expenditures within the federalist system and by the areas of policy innovation. Peterson (1995) describes changes in spending patterns for the federal and state governments between 1962 and 1990 in order to look at their respective dominate policy areas. Peterson divides expenditures into two primary categories: *redistributive* and *developmental*. The author defines redistributive expenditures as those policies that shift economic resources from one group to another (from business and prosperous individuals to the elderly, the disabled, or the poor) and defines developmental expenditures as those that facilitate the expansion of economic resources in general (social and physical infrastructure). Over the thirty-year timeframe (1962-1990) analyzed by Peterson, the federal government's expenditures for redistributive policies grew at a faster rate than the expenditures for developmental policies[1]. At the same time, the opposite has occurred at the state level. Developmental expenditures increased dramatically at the state level (at a level more than double the federal expenditure for developmental policies) while redistributive expenditures realized only modest increases. Peterson argues that this indicates that the federal government is increasingly concerned with redistributive polices while the states are primarily focused on developmental policies.

[1] Peterson indicates that the federal government's redistributive expenditures grew from 4.8% of the gross national product (GNP) in 1962 to 10.3% in 1990. Over the same time period, the federal government's developmental expenditures increased from 4.2% to 5.2% of the GNP.

In terms of specific innovative policies, the "resurgence" described by Bowman and Kearney looked at several specific areas where there was an increase in the innovative policy making at the state level. They examined economic development policy, education policy, and hazardous and nuclear waste policy. The authors suggest that these policies provided new methods of dealing with these issues and that they were readily adapted in other states and even at the national level. Other researchers have supported this argument. The Council of State Governments (1990) described innovation at the state level in health, the environment, and economic development. Other areas that have seen increased state action include welfare reform, health care reform, corrections, and anti-crime measures (A.C.I.R., 1985; Van Horn, 1993; Gray and Eisinger, 1991; Hedge, 1998). Welfare reform began in more than thirty states in the early 1990s and increased exponentially after Clinton ended the Aid to Families with Dependent Children program in 1996. "Get-tough-on-crime" legislation (including waiting periods for the purchase of handguns, the banning of assault weapons, and mandatory-sentencing measures) began at the state level, and comprehensive health care reform is being tested first at the state level [in 1993 alone, 1,850 health care reform proposals were introduced in state legislatures (Gray, 1994)]. Many of these policies are just now finding themselves on the national agenda, in some cases, years after they were initiated at the state level (health care reform is one of the best examples of this phenomena).

Having considered whether state governments are the appropriate level for policy interventions, it is important to better understand what determines whether governments will respond with new, or *innovative*, policy to any particular problem. By innovative policy, researchers are describing policy that is qualitatively different from existing policy.

Wilson (1989) argues that innovation occurs when there is a "fundamental" change in a "significant" number of "tasks" conducted by the organization. Innovative policy may be new and comprehensive and introduced to address new or existing problems (possibly the policies of an in-coming administration that represents a different ideological party dealing with new and existing problems) or policies may address new, evolving problems using the existing programs to implement the changes (the response to AIDS in the late 1980s). Desveaux, et al. (1994) label the former innovation as "deep policy innovation" and the latter as "shallow policy innovation." The authors suggest that governments will react to a problem with innovative policies if they perceive that the problem is unique and that incremental changes to existing programs will not be sufficient to "relieve either the problem or public pressure [to address the issue]" (1994, p. 500). The authors go on to define policy innovation as occurring when "it deals with a complex problem in a comprehensive fashion...[and] it relieves public pressure, relaxes the constraints on politicians, and permits scarce political resources to be redirected to other pressing challenges" (1994, p. 502).

The research on policy innovation suggests there are certain times when state governments, in particular, will adopt innovative policy. Frances Berry (1994) describes four models to explain what causes state governments to introduce innovative policy: internal determinants, regional diffusion, national interaction, and a hybrid of these models. According to Berry, the *internal determinants model* suggests that state policymakers will primarily (almost exclusively) consider factors inherent to the state when deciding the types of policies that should be adopted. In this model, the policymakers are seen as "fully independent" from outside influences. The second model, *regional*

diffusion, predicts that a state is increasingly likely to adopt a new policy as the number of closely surrounding states enact similar policies. This is particularly true when the region has a similar political, social, and economic culture (Walker, 1969). Closely related to the regional diffusion model, the third model, *national interaction*, predicts that state policymakers are more likely to adopt a policy as the number of national contacts with officials from other states (who have already adopted a similar policy) increases. Finally, Berry argues that a hybrid of these models is necessary to reflect "both [the] internal [state] determinants and diffusion among states" that occur when states adopt new policies. In earlier articles, Berry and Berry (1990, 1992) introduce a methodology (a pooled time-series analysis called "event history analysis") that takes these factors into account and allows researchers to empirically test what drives innovation. The author demonstrates that this hybrid approach tends to be the most accurate for explaining why and when states adopt innovative policy. Oliver and Paul-Shaheen (1997) test these models by looking at comprehensive health care reform in six states. The authors argue that the national interaction model, when coupled with a supportive internal political culture, most closely reflects the way the policy innovation occurred in the subject states, indirectly supporting Berry's hybrid model.

Having examined why and when states develop innovate policies, the next questions becomes what allows certain innovative policies to be adopted and implemented? Building on the work of James Q. Wilson and R. Douglas Arnold, Oliver and Paul-Shaheen (1997) suggest that policies are most likely to be adopted and implemented if the policy is designed to maximize perceived benefits while minimizing costs. The authors argue that the policy leader, or *entrepreneur*, must employ both

technical skill and political intelligence to create concentrated benefits (to develop eager customers), dilute concentrated costs (ease economic, procedural, or symbolic burdens), or convert diffuse benefits into concentrated benefits (by making them more tangible or more immediate). The authors go on to describe how the environment in which these policies are developed (especially health care reform policies) is a primary factor in whether a policy will be developed, adopted, and implemented. They suggest a model to understand this environment that centers around two broad categories of factors: *contextual conditions* and *dynamic factors*. *Contextual conditions* are seen as the institutional factors that are relatively stable over time. These conditions include socioeconomic, political, and other institutional factors of the state (e.g., levels of income, political culture, partisanship distribution, type and location of health care delivery system, historical health care reforms). The second category, *dynamic factors*, include conditions that tend to be individually-centered including leadership style, leadership ides, and individually-created power structures (e.g, personal commitment to challenge the status quo, the drive to exploit opportunities to solve problems, and the power to generate resources to translate ideas into action). The authors argue that health care policy innovation tends to be facilitated, rather than activated, by the contextual conditions within the state. Institutional factors (e.g., partisanship, historical health care policy activism) facilitate "broader reform by (1) expanding the scope of conflict on the issue to include individuals and institutions more favorably disposed toward major reform than those who regularly participate in the state health policy community; (2) providing an opportunity to incubate ideas for innovation and test their political feasibility; (3) modifying self-interest and partisanship through information and deliberation; and (4)

huilding on the suhstantive and political progress of earlier initiatives" (1997, p. 739). As important as these conditions are for health policy innovation, the authors' analyses indicate that "the ultimate determinants of a state's capacity for [health] reform are the relatively dynamic factors of leadership, ideas, and power" (1997, p.741). Leadership was critical for its ability to generate attention to the issue and the commitment of other important actors in the system (including executive and legislative members) to addressing the issue. But, in order to maintain the attention of these political players, the policy leader must also be ahle to generate ideas that can define the current situation and future trends as well as guide the development of innovative solutions. Finally, the individual must have enough power to secure the appropriate resources to translate the ideas into action.

States and Health Policy

If asked whether health policy should be developed at the state or federal level, most health policymakers would be unahle to provide a definitive answer. There are solid rationale for policy development at both levels. State or regional boundaries do not restrict many health problems, and solutions to combat these prohlems may achieve greater economies of scale by having federal administration. Another reason for federal policy development includes calls hy the health care system for national standards of quality or technological regulation. Finally, the federal government may be given responsihility when there is apparent market failure (e.g., minorities in the U.S. still find access to care difficult or substandard in some areas). Even state policymakers have difficulty choosing between state and federal health policy development. Health care expenditures can wreak havoc on state hudgets and the federal financing of health

programs is extremely attractive to state legislators trying to balance a budget. However, states have consistently shown that they are unwilling to abdicate their authority over health issues to the federal government and many of the current health policy debates at the federal level (focusing on quality and access in health care systems) are challenged under the charge that federal agencies are "stepping on" traditional state functions (Sparer, 1993). Other reasons for state input into health policy development is that it provides incentives to look for innovative solutions and prevents program stagnation. Additionally, state involvement allows "different parts of society different amounts of time to adapt to change because some may be ready to accept it sooner than others" (Davidson, 1997).

The literature on health policy innovation often includes this pull between the state and federal government (Leichter, 1997; Weissert and Weissert, 1996). For example, Peterson, when examining the role of the states in the development of health policy asks, "What can and should we, then, expect of states as the crucibles of health policy. . .Are they capable of playing a dynamic role in health policy making, and if so, to what end. . .here do they [the states] fit in the American federalist system, so transformed by practice, law, financing, and judicial interpretation since the ratification of the Constitution more than two hundred years ago. . .What are the sources of innovation. . .What limits do states still face as potential policy leaders. . .What are the dynamics of health politics within the states?" (1997, p. 688). These questions are reasonable, and provide a good framework for trying to understand the role of the states in developing health policy. However, it can be cynically argued that that these are rhetorical questions, because the fact is that the states have traditionally been *the* source of health policy innovation.

Irrespective of how the states are functioning overall and which factors are most important to ensure effective policy implementation, the role of the states in developing and implementing innovative health policy is hard to dispute. States have traditionally been responsible for many aspects of health policy including the regulation of insurance and medical providers, public health, and tort law concerning medical malpractice. In fact, the U.S. health care system is *defined* by variations between states. In the few areas where there has been significant federal involvement, primarily social welfare policy [i.e., Medicaid, Aid to Families with Dependent Children (AFDC)], significant "deevolution" to the states began during the mid 1990s (Kondratas, et al., 1998). In the 1990s, the states were looked to by liberals as the source of innovative policies that could be easily adopted at the federal level (e.g., expansion of health insurance coverage) and conservatives looked to the states for ideas that would allow federal agencies to delegate the delivery of certain health welfare programs to state and local agencies (Sparer, 1998). Even the most comprehensive federal health care reform legislation to pass in the 1990s, the Health Insurance Portability and Accountability Act of 1996 (HIPAA), included provisions that allowed state insurance commissioners to develop the rules and enforcement procedures for the law, so that they could better meet community needs within each state. As the century comes to an end, the federal government is relying heavily on the experience and innovations that have occurred at the state level to develop the next round of national health care reform legislation.[2] Anton goes further and asserts that the "states are now, and are likely to continue to be, the leading participants in shaping future health care and

[2] Virtually all of the health care reform proposals introduced during the 105th Congress (1997-1998) have previously been implemented at the state level over the last decade. The only exception has been the call for a federal body that would set and enforce quality standards for health insurance plans.

welfare policy. . .[especially] addressing the central issues that need attention: the problem of currently uninsured populations and the problem of cost" (1997, p. 715).

Sparer (1998) provides a good summary of the evolution of health policy in the U.S. federalist system. He argues that the states have played a critical role in health policy development from the beginning of the nation. Most of the early state health policy concerned the distribution of medical services to those who could not afford care and public health issues (e.g., the prevention of communicable diseases). Under the influence of the English poor-law tradition, social welfare programs (including the provision of health care to the indigent) were considered a local responsibility. This changed following the Great Depression when the federal government expanded its role in providing certain welfare programs, although it was not until the 1960s that the federal government expanded into the realm of health policy with the creation of the Medicare and Medicaid programs. However, over the next thirty years, the states resumed their role as the innovators of health policy with the federal government repeatedly defeated in its attempts to establish a national health care system. As stated earlier, the result has been that the states continue to dominate health policy in our federalist system with the licensing of health care providers; the granting of approval for the construction of health care facilities based on local community need; the regulation of health insurance; the administration of workers' compensation services; medical malpractice standards; and public health services (including primary care delivery for high-risk populations, like pregnant women at high risk for pre-term delivery).

States and Health Policy Analysis/Evaluation

In response to the responsibility for health policy innovation falling on the states, they are becoming increasingly reliant on sophisticated actuarial and economic estimates of policy impacts, as well as policy evaluation techniques to determine whether programs are having their intended effect. Coburn (1998) looked at this use of policy evaluation and analysis at the state level. He found that state policymakers are increasingly using these techniques to "help in thinking problems through" and "sorting out the potential policy or programmatic responses." He goes on to explain that the area of health policy has been a driving force in the increase in policy evaluation utilization as states are forced to deal with the restructuring of their Medicaid programs; as they seek ways to deal with health care payment, distribution, and regulatory problems; and as they develop innovative health care reform initiatives. He concludes by suggesting increased collaboration between state governments and academic policy programs in the state.

The collaboration that Coburn calls for may take many forms, however, the key is to combine the elements of the applied (policy analysis/policy evaluation) and the conceptual (political science). In complex substantive fields like health policy, the need for these two areas to be combined is essential. Davidson (1997) argues that one of the primary reasons for the 1993 Clinton Administration health care reform proposal failure was that significant effort was put into the policy development and assessment component, without the same work put into the political considerations. Davidson states that "even though the analysis [of the reform proposal] was based on a detailed understanding of how the health care system operates and what it produces, the people who assembled the pieces into a comprehensive plan failed to allow sufficiently for the complex interplay of

[political] forces - including the actions of interests groups, the state of the economy, the composition of Congress, and other factors - that determine whether an idea becomes a law" (1997, p. 880).

Other advocates also see where social science research in health and medicine serves several functions. Mechanic (1995) describe several "roles" performed by social scientist in health including: framing the issues; intelligence; monitoring; evaluation and assessment; and implementation. In Mechanic's description, social science researchers in health policy establish a framework for looking at a particular issue, which helps to capture the attention of policymakers. Much of its success in the policy process comes over a long-term timeframe through continuous efforts that "stimulate editorial writers, commentators, journalists, and policy personnel" (1995, p. 1494). Social science researchers are also important sources of intelligence, that is, they are able to describe emerging trends and future problems. The third role of the social scientist in health policy is that of monitoring. Mechanic states that "in the health arena, social scientists design, administer, and analyze sophisticated surveys that track the prevalence of morbidity, use of services, expenditures, access and satisfaction, function and disability, and many other health related parameters" (1995, p. 1495). Finally, social scientists are important sources of evaluation and assessment of health care programs and policies, and help policymakers to understand the factors that may hinder or help implementation.

Of the social science fields that contribute to health care policy, the field of political science may be the most important. Thompson argues that "[d]espite growing federal involvement with health issues as well as their aura of life and death importance, relatively few works have probed the politics of health. . .[i]n particular, the role of the

bureaucracy in shaping who gets what from health programs has escaped attention. . .[t]his neglect is serious, for the results of policy often have as much to do with the politics played out after a bill becomes a law as the politics in evidence prior to passage" (1983, p. 2). In his book examining the politics of health care, Thompson reviews eight health policies to look at their impact and concludes that implementation is critical in shaping "who gets what" in the health care system. But the author also concludes that the realization that implementation is critical is a far cry from understanding the process by which it becomes so important for the allocation of societal resources. The next section will examine how the process of implementation works.

Issues in Policy Implementation

Policy innovation in the states is not enough to guarantee issues will be addressed unless resources are also devoted to the proper *implementation* of the policies. What is public policy implementation? Pressman and Wildavsky (1984) take the literal definition from the dictionary and add one word, "policy." Their definition is "to carry out, accomplish, fulfill, produce, and complete a policy." This is a rather simple, yet attractive, definition. Other authors expand on this premise and define implementation as "the carrying out of a basic policy decision, usually incorporated in a statute but which can also take the form of important executive orders or court decisions. Ideally, that decision identifies the problem(s) to be addressed, stipulates the objective(s) to be pursued, and, in a variety of ways, 'structures' the implementation process. The process normally runs through a number of stages beginning with passage of the basic statute, followed by the policy outputs (decisions) of the implementing agencies, the compliance of target groups with those decisions, the actual impacts-both intended and unintended-of those outputs,

the perceived impacts of agency decisions, and finally, important revisions (or attempted revisions) in the basic statute" (Mazmanian and Sabatier, 1983, p. 20). This is one of the best summaries of implementation, however, it fails to make the point that implementation should be thought of as one of several steps in the policy process. Along with policy formulation and policy evaluation, implementation is one step toward the solution of a problem.

Until Pressman and Wildavsky released the first edition of their book, Implementation, in 1973, there had been little examination of why public programs succeeded or failed. It had been assumed that the success or failure of a program was predetermined when it left the hands of the policymaker and that implementation was a given. Over the last twenty years, however, others have examined this assumption and the resulting discussion has produced at least two distinct phases, or generations, of research on implementation and one phase that has been trying to emerge from the previous literature to become a third generation since the mid-1980's (Sabatier, 1986; Goggin, 1986; Lester et al., 1987; Williams, 1980; Younis, 1990; Goggin et al., 1990). At this point, it is necessary to look at each of these phases.

The first phase of implementation research was mainly concerned with "detailed accounts of how a single authoritative decision was carried out, either at a single location. . .or at multiple sites" (Goggin, 1986, p. 328). Most of this research entailed case studies that tried to determine which barriers hindered successful implementation. These studies had several common features including: a detailed, qualitative investigation of the problems encountered by the street-level implementers when they tried to introduce a new project or alter an existing program; a broad conceptual model that tried to incorporate

several economic, political, bureaucratic, organizational, and social factors; a "top-down" system of analysis where the policy is examined from its inception down to its local implementation in order to determine the extent to which its goals and objectives have been met; and generally, a pessimistic outlook (Pressman and Wildavsky, 1984; Derthick, 1970; Bardach, 1974). This early research was very qualitative in nature, although it did provide some interesting conclusions, such as Pressman and Wildavsky's (1984) description of the difficulty of successfully implementing a policy when multiple veto points are present.

The second phase of research appeared during the early to mid-1980's and involved a move toward the development of models that attempted to conceptualize and identify factors that helped or hindered policy implementation. This second generation had the following common features: a more analytical approach; it often used a certain conceptual model to test across several policy areas; an it attempted to quantify certain factors for analysis; and it had a slightly more optimistic outlook (Goggin, 1986; Sabatier, 1986; Younis, 1990). Researchers such as Van Horn and Van Meter (1975), Sabatier and Mazmanian (1980, 1983), and Edwards and Sharkansky (1978) all developed conceptual models that were used by several authors with varying degrees of success (Lester and Bowman, 1989; Browning, Marshall, and Tabb, 1980; Rosenbaum, 1980; Goodwin and Moen, 1980).

Two of the most significant problems that came out of this second phase of research is what Goggin (1986) calls the "too few cases/too many variables" problem and the debate over "top-down vs. bottom-up" models in implementation studies (Sabatier, 1986; Younis, 1990). Besides the empirical difficulty in quantifying many of the variables

in these conceptual models (i.e. program specificity, support from leaders), Goggin argues that the first two generations of implementation literature failed to "differentiat(e) among types of implementation outcomes, or in specifying the causal patterns associated with these outcomes, the frequency with which these patterns occur, and the relative importance and unique effects of each of the various independent variables that are part of any multivariate analysis of implementation performance" (Goggin, 1986). The result of these conditions has been a reliance on a multitude of variables with few observations.

The second issue is closely related to problems in intergovernmental relations. Since many policies are created and implemented in our federalist system, implementation research began asking what factors help/hinder implementation in this system. Whether implementation is driven by top-down, national factors (Van Meter and Van Horn, 1975; Edwards, 1980; Mazmanian and Sabatier, 1983) or bottom-up, "street-level" factors has been an area of considerable debate (Elmore, 1978; Sabatier, 1986). Krane (1993) explains that the top-down model of implementation is a "rational-technical" process that depends on the "marshaling of resources" (i.e., funding, skilled workers, and facilities) to ensure effective policy implementation. The top-down approach argues that the implementation process can be directed by the federal actors through, among other factors, statutory development, proper allocation of resources, and support from the agency leaders. This approach has been criticized for its inability to demonstrate which factors are the most important under which circumstances and the assumption that the policymakers are the most critical actors in the implementation process (Sabatier, 1986; Lester, et al., 1987). In contrast, the bottom-up approach stresses the importance of the persons that are responsible for delivering the services and client interaction, or the street-

level bureaucrats, for successful implementation. The literature on the bottom-up approach argues that these actors are able to effectively distort or resist cooperating with these policies through various techniques. Because of this, this research suggest that policy outcomes are determined by interaction and bargaining between agency actors and the clients (Elmore, 1978; Sabatier, 1986). The bottom-up approach also takes into account the lower-level bureaucrat's individual commitment, identification, and knowledge of the policy's goals and objectives (Lipsky, 1977; Hedge et al., 1988).

In order to overcome these deficiencies, Goggin and others (Lester et al., 1987; Sabatier, 1986) have argued that a third generation of literature needs to be developed that can better access the factors that affect implementation in order to shake off this "intellectual baggage" (Williams, 1980). Many of these authors believe that this third phase of research should involve the development of testable theory, especially by linking outputs to outcomes, and by demonstrating causal relationships. This is not to say that the literature does not address this output-outcome link, but that the current literature tends to focus on its inability to show that the link exist. Most of the literature on this issue tends to describe the failure of policy outputs to produce the expected outcomes (Morgan, 1996). This dissertation will address these issues and contribute to a third generation of implementation research.

What are some of the factors that can help or hinder policy implementation? Even with all of the criticisms of this implementation research, a good conceptual framework has developed from the literature and some factors have been quantified. There have been several analytical models (Mazmanian and Sabatier, 1983; Van Meter and Van Horn, 1975; Elmore, 1978) and several case studies that have tried to determine which factors

have the greatest impact on the implementation process (Pressman and Wildavsky, 1984; Hanford and Sokolow, 1987; Mazmanian and Sabatier, 1981; Edwards and Sharkansky, 1978), but few studies have identified good measures of these factors (West et al., 1990-91; Lester and Bowman, 1989; May, 1993; Wood, 1992; Hedge et al., 1988, 1989, 1991) and fewer still have tried to link these factors to outcomes (Durant and Legge, 1992; Ringquist, 1993). Among the most useful factors that have been examined include: problem tractability, organizational factors, environmental conditions at the bottom of the implementation chain, and the attributes of actors at the various levels of implementation. Each of these factors need a more thorough explanation.

Problem Tractability

A policy is often created to solve a problem. Depending on what type of problem the policy is trying to solve (social, economic, environmental, etc.), the chances of implementation success or failure can be surmised. Some problems are simply more difficult to solve than other problems. Hazardous or nuclear waste is simply more difficult to manage than solid waste. This is especially true of the problems that come into the public sector for solutions. These problems have often been delegated into the public sector because of market failure in the private sector, yet they are problems that must be managed. Paul Sabatier and Daniel Mazmanian (1980,1981,1983) conceptualized this idea in a series of publications released in the early 1980's. Several authors used their implementation model and found the concept of tractability withstood examination (Goodwin and Moen, 1980; Browning, Marshall, and Tabb, 1980; Rosenbaum, 1980; Mazmanian and Sabatier, 1981). Under this concept one can conclude that to the extent the problem has valid technical solutions, technologically accurate instruments of

measurement, specific types and amounts of behaviors to alter, an identifiable and geographically concentrated population to target, the problem has a higher or lower degree of tractability that will help or hinder implementation.

Organizational Factors

How well bureaucratic entities function can be one of the greatest indicators of implementation success or failure, and so bureaucratic capabilities in the form of structure, communication, leadership, coordination, and resources can make the difference between success and failure. Pressman and Wildavsky (1984) often cite the inefficiency of the project approval system of the Economic Development Administration's (EDA) Oakland project as one of the greatest obstacles in its implementation. The actors involved had far too many clearance points (or agencies) to go through to gain approval for projects. The authors calculated that it would often take 30 to 70 steps to gain approval. These "veto points" caused several delays in implementation and often ultimate failure for particular projects. Related to this, the structure of the agency and the implementation of the program can be very important to its function (Pressman and Wildavsky, 1984; Reppucci and Suanders, 1978; Sherman, 1978; Maynard-Moody, Musheno and Palumbo, 1990; Hasenfeld and Brock, 1991). Whether the agency's decision-making process is centralized or decentralized can affect the implementation process through the ability to ensure accountability or the ability to respond quickly to a changing environment. What type of departmentalization has been utilized (program, function, client type, or geography), and how the agency is able to change with its environment may all have an impact on implementation. Another point of failure in the EDA project in Oakland was that the agency was not able to change as the obstacles increased. With each delay, the

expectations of the actors involved changed and the EDA could not keep with the changes (Pressman and Wildavsky, 1984). Effective leadership within agencies is also important to program implementation (Pressman and Wildavsky, 1984; Sharp, 1981). The value of a consistently active leader has increased the probability of success for many programs, as much as the ineffective leadership or departure of an effective leader has brought a level of decline to many programs. Pressman and Wildavsky (1984) indicate that one of the first negative turning points of the Oakland project was the departure of Eugene P. Foley as head of the EDA. Soon afterward, the relationship of the project to other agencies and its importance within the EDA proved more complicated. However, other authors (Sabatier and Mazmanian, 1980) point out that "...leadership skill remains a rather elusive concept." While everyone acknowledges its importance, its attributes vary from situation to situation and thus it is extremely difficult to predict whether specific individuals will go beyond what could reasonably be expected in using the available resources in support of statutory objectives." Resources (in the form of personnel, equipment, information, expertise, and available funds that can be distributed to clients) can be one of the most important influences on successful implementation (Van Horn and Van Meter, 1987; Pressman and Wildavsky, 1984; Mazmanian and Sabatier, 1983; Paul-Shaheen, 1990). Several authors find this to be an obstacle in the implementation of environmental regulation (Lieber, 1983; Worthley and Torkelson, 1983; McDowell, 1988; Hanford and Sokolov, 1987), while others find this concern in social policy (Edwards and Sharkansky, 1978;). The level of resources can be a measure of the policy's importance in the eyes of external actors (legislatures) and resources can also be used as a measure of internal political factors

because they can reveal which programs can gain priority within the organization (Ringquist, 1993).

Environmental Factors

This concept tends to be the dumping ground for the factors that tend to include the political, socio-economic, and demographic factors of the area in which the program is to be implemented (Crotty, 1988; Mazmanian and Sabatier, 1983; Pressman and Wildavsky, 1984). In practice, these variables tend to become the control variables in the models and play a mediating or confounding role in terms of trying to link outputs to outcomes. These factors would be conceptualized as non-statutory variables under the Mazmanian/Sabatier model of implementation. Pressman and Wildavsky (1984) found that the EDA staff cited the troublesome political environment of the city of Oakland (especially the resistance of the first mayor during implementation) as a serious obstacle to successful implementation. Other authors (Goodwin and Moen, 1980) found that economic factors influence the ability to implement some social policies.

Attributes of the Actors

After having taken all of these larger factors into consideration, there still remains one factor to examine, the role of the individual actor (county health unit administrator, coalition member, nurse practitioner, and clients). The role of the individual in the policy process has been an issue of debate since the turn of the century. With the rise of the "New Institutionalism" concepts in political science, the role of the individual has become challenged once again (March and Olsen, 1984). Of all the attributes that the individual has at his/her disposal to shape the behavior of organizations, the following three attributes are most important: cognitive ability, motivations, and attitudes.

By cognitive ability, the literature is describing the psychophysiological ability of a person to process information and make decisions. Motivations are those internal factors that define the reasons for individuals to engage in any activity. Finally, attitudes are those internal characteristics that shape the type of action to be undertaken and have the ability to distort the other two attributes. In order to understand how these attributes affect the shape of implementation process, each must be examined in greater detail. The cognitive ability of individuals has been one of the earliest factors studied in organizational theory. Max Weber was one of the earliest individuals that argued the rationality of the decision-making process was imperative in optimizing efficiency in bureaucracies. To the extent that an individual can receive and translate information into a decision in a rational manner, the more likely it is that a policy will be implemented in a manner consistent with the organization's objectives (Fry, 1989). However, the cognitive ability of individuals to make purely rational decisions has also been questioned from an early time. Herbert Simon argued that individuals are limited in their ability to make "rational" decisions because they are cognitively limited, that is, they are unable to consider all information and options at the same time. Furthermore, what information is available has been biased by a limited perception that has been structured by other attributes such as the individual's attitudes and motivations. The result is a set of decisions that rely only on the biased information that can be considered at that particular point in time, thus we get Simon's "satificing man" (Fry, 1989). If we assume that efficiency (the greatest possible output for the least input) is the rationale for organizing, than this limited cognitive ability of the individuals within the organization reduces the capacity of the organization to realize

efficiency. This can manifest itself in higher monetary costs or policy outcomes significantly different from what was intended.

The second attribute of individuals that can shape the behavior of the organization is the motivation of the individual. Gortner, et.al. (1989) describe how motivations affect the behavior of organizations. First, motivations are some of the primary reasons that individuals decide to join and continue to participate in organizations (Rusbult and Lowery, 1985). Second, motivations can determine the extent to which the individual agrees to pursue either personal or organizational goals. Finally, motivations determine the extent to which individuals allow others to direct or control their behaviors. Gortner, et. al. examine Anthony Downs' typology of bureau official motivation to understand how motivations shape organizational behavior. Downs describes five types of individuals: climbers, conservers, zealots, advocates, and statesmen. The first two types are seen to be primarily motivated by self-interest. The climber seeks to maximize his/her power, prestige, and monetary reward by "climbing" the organizational ladder as quickly as possible. The conserver seeks to maximize his/her security and convenience by resisting change and avoiding actions that may reveal failure. The implication for the former type is that he/she can help to maximize short-term goals at the cost of alienation of co-workers and subordinates which results in lower moral, while the latter can impede the responsiveness in the organization to new problems. The other three types of officials have motives that are combinations of self-interest and altruistic loyalty. These motivations can have positive effects such as overcoming inertia, promoting change, and obtaining resources for the organization, but they do so at a cost. These motivations can cause alienation among personnel within the organization and between organizations.

They can also distort the overall goals of the organization by redistributing resources away from product output to institutional preservation.

The final attribute of individuals to be examined are attitudes. These are cultural and professional norms and perspectives that have the potential to filter the perception of information (limiting cognitive abilities) and distort organization goals and objectives (altering motivations). Attitudes are shaped from birth are influenced by the family, school, peers, and society at large. How do attitudes shape the behavior of organizations? The clearest way is by distorting the decision-making process and the implementation of policy (particularly at the street-level). Hedge, Menzel, and Williams (1988) look at five attitudes that they presumed would have an affect on site-level regulation. They believed that the extent to which inspectors had certain attitudes (rule orientation, perceptions of coal operators, etc.) the greater would be the enforcement of the regulation. They found that some of these attitudes do tend to affect the level of enforcement. They concluded by suggesting that these attitudes may hinder the ability of centralized authorities to control subordinates' behaviors, thus distorting the impact of the policy. Lipsky (1976) also finds evidence that the attitudes of individuals can distort not only the distribution of bureaucratic outputs but the perception of the organization by the clients as well. With the problems that these attributes can cause in organizations in mind, the question becomes to what extent can organizations control these effects? The primary and traditional form of control has been the structure of the organization itself. The Founders of the Constitution saw organizational structure as the primary method of control the excesses of the individual and the masses, thus they constructed an institutional separation of powers (Hult and Walcott, 1989). Many of the early theorist in organizational theory

(Frederick Taylor, Max Weber) saw the structure of the organization as the primary tool in controlling individual attributes that could affect efficiency. The effects of cognitive limitations can be controlled by centralizing decision making so that the effects are minimized, by standardizing the decision-making process, and by monitoring decision making. The fewer the number of individuals involved in decision making, the fewer the opportunities for discretion, and the greater the chance to discover deviations from objectives , the less the potential for distortion of policy implementation (Kaufman, 1967; Fry, 1989; Perrow et al., 1989). Reorganization and the internalization of agency objectives can be used to refocus individuals' motivations away from unfavorable behavior toward greater agency responsiveness (Kaufman, 1967; Fry, 1989). Socialization, professionalization, and recruitment policies have also been promoted as tools to restrain the effects of attitudes (Kaufman, 1967; Kearney and Sinha, 1988). All of these tools have been used at different times, with varying degrees of success, but there are drawbacks to using these methods.

Organizations that rely on strong, centralized authority in decision-making processes can be too rigid and unable to respond to new problems. The result may be an organization that has a dramatic decrease in efficiency or the inability to remain efficient at a reasonable cost (Chubb and Moe, 1988). Reorganization may produce more political than organizational benefits and these tactics often have cost associated with them that make their use questionable (Meier, 1980). Socialization, professionalization, and recruitment may increase individual responsiveness, but only within certain limits. Hedge, Menzel, and Williams (1988) point out that these methods of controlling behavior could be overpowered by proximate influences like local interaction and other attitudes. Other

factors like outside political interest and legalistic constraints may also have an effect (Moe, 1985; McCubbins, Noll, and Weingast, 1987; Bendor and Moe, 1985).

This is not to say that none of these make any difference in controlling the effects of these attributes, but rather, they are limited in the extent that they work. No single, bureaucratic tool can control these individual attributes (at least, not without more serious consequences), just like no single individual attribute can determine organizational behavior. It is also possible that these control methods work better in either spatial or temporal situations. What works at one time may not work at another and what works in one organization may not work in the next (Tipple and Wellman, 1991). This is why it is important to continue to study both sides of this equation, the individual attributes and organizational controls, especially in terms of how the individual affects implementation.

Summary of Policy Literature

As this discussion demonstrates, in order for innovative policy to be implemented successfully there are many factors that must be considered by the policymaker and the implementing administer. Policymakers, administrators, and academics continually look at these issues to understand whether a program has achieved the desired outcomes. The next portion of this literature review will examine the social health problem of low birthweight births and the programs created to address the problem.

Public Policy Problem: Low Birthweight Births

From birth until death, humans are faced with potential health problems that affect both the length and quality of life. Newborns face a beginning predestined by the genetics and the lifestyle of their parents (especially the impact of the mother's behavior on the fetus in her womb), and the health care resources of the community. Children grow in an

environment that presents the danger of accidents, limited access to health care services, potentially fatal illnesses, and a range of devastating social conditions like poverty. Adolescents continue to develop in a world wrought with accidental death and illness, but also must face new dangers resulting from high-risk personal behaviors like casual sexual relations, drug and alcohol abuse, tobacco use, and the prevalence of violence in the current youth culture. While some of these threats diminish in adulthood, new problems arise in the form of certain mental illnesses, stress-related conditions, poor dietary habits and obesity, and occupational injuries. As people approach their later years, the cumulative effect of the problems faced earlier in life begin to take their toll on health. Heart disease, cancer, and other health conditions become the primary causes of death, and dealing with these conditions are compounded by concerns over the financial burden of immediate and long-term health care. Because health problems facing an individual are common among most people at the same point in life, society often calls for public interventions to address these health conditions.

Public interventions usually take the form of public health programs that focus either on the prevention of illness, the reduction in the spread of disease, or the facilitation of access to health care. Prenatal care for high-risk pregnant women, childhood immunizations, epidemiological monitoring of disease outbreaks, and medical services funding programs like Medicaid and Medicare are all examples of public interventions. In order to get these programs initiated and continued, policymakers must be convinced of the existence, severity, and pervasiveness of the problem. This is often accomplished by utilizing policy analysis and program evaluation. The extent to which these analyses can be understood and are able to demonstrate that the program will solve the problem for

which it is intended to address, determines the likelihood that the policies and programs will exist. For example, Yankauer, in his analysis of social policy and the use of social sciences states "[t]he WIC program - like Head Start, Improved Pregnancy Outcome (IPO), and other large child heath and welfare programs - was sold to legislators by advocacy groups on the grounds that the services provided would achieve gains in health that could be measured by specific health indicators. . .[t]he strategy by which these programs were promoted and sold to legislators thus left their advocates in a vulnerable position if evaluation failed to show that measurable outcomes had been achieved as promised, or that the program costs exceeded their benefits by a substantial margin" (1985, p. 181).

This section will look at a public health problem and the programs developed to address the problem. The first part of this section examines the importance of the issue (i.e., the incidence, causes, and impact of low birthweight births). Next, the section will describe the medical and psychosocial interventions that have been introduced to reduce the incidence of this condition. With this general understanding of the problem, the next part of this section will describe national and state programs developed to reduce the incidence and effects of low birthweight births. Finally, this section will describe the prevention program developed in Florida on which the rest of this research will be conducted.

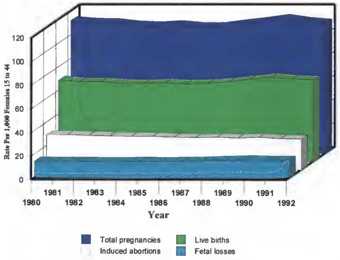
Low Birthweight (LBW) Births: Incidence, Causes, and Impacts

In the United States, just over half of all pregnancies to women between the ages of 15 and 44 years result in a live birth (Figure 1). The rest of these pregnancies are ether terminated through induced abortions or are the result of fetal demise (in fact, many

pregnancies spontaneously terminate before the woman is even aware that she was pregnant). For those pregnancies that do result in a live birth, the threat of the infant dying prior to its first birthday is still a serious concern. For this reason, a great deal of health policy is focused on understanding what factors increase the risk of infant mortality.

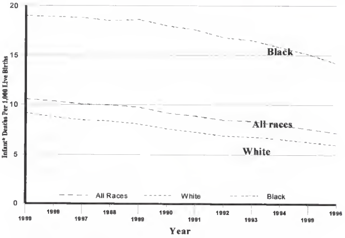
Infant Mortality and the Low Birthweight Birth Rate Link

Infant mortality has been a major health policy issue in the United States since its creation. In order for a nation to grow, its population must have sustained growth through natural birth and immigration. In addition, the personal impact of an infant death is one of the most traumatic experiences most people will ever endure. For these and many other reasons, infant mortality is a serious public concern. Although Many significant strides have taken place over the last century. In the United States, overall infant mortality has declined from 140 deaths per 1,000 live births at the turn of the century to 7.2 deaths per 1,000 live births in 1996 (see Figure 2). Even with the decrease in overall mortality rates, each year there are still approximately 22,000 newborn deaths within the first 27 days after birth (Adams,1995).



Source: U.S. National Center for Health Statistics *Vital Statistics of the United States*

Figure 1 -- Pregnancies and their outcomes in the United States: 1980-1992



Source: U.S. National Center for Health Statistics *Vital Statistics of the United States*
*Under one year of age

Figure 2 -- Infant mortality rates in the United States: 1985-1996

As Figure 2 indicates, overall infant mortality rate has been declining steadily, although there remains a significant difference in mortality rates between whites and blacks in the United States. Between 1950 and 1991, infant mortality for white infants declined by 3.23% per year, while infant mortality rates for blacks in the U.S. only declined by 2.89% annually (Singh and Yu, 1995). Birth outcome disparity between whites and blacks in the U.S. is an area of constant attention in the public health policy field. Considerable research has examined the racial disparity in infant mortality and other poor birth outcomes, however, no conclusive evidence points to any of the known correlated risk factors as the sole reason for the disparity. The racial difference is constant throughout the data examining the factors that contribute to infant mortality (Frisbie et al., 1997; Shiono, et al., 1997). An interesting note on this subject is that the racial disparity in birth outcomes only seems to apply to U.S. born blacks. Persons of African descent, whether immigrating directly from Africa or from another part of tbe world, consistently report birth outcomes similar to the white population in the U.S. and considerably better than U.S.-born blacks. This remains true even when many of the other risk factors (e.g., low educational attainment, poverty) are present. Why this disparity in birth outcomes exist in the U.S.-born and African immigrant populations continues to be studied (Wasse et al., 1994; David and Collins, 1997).

The healtb policy literature has examined many factors in order to determine what has the most significant impact on the chances of infant mortality. Some of these factors examined include: mother's age; mother's education; mother's smoking status during pregnancy; the trimester when prenatal care began; the sex of the infant; the gestational age of the infant; and the infant weight at birth. As demonstrated by Figures 3 through 14,

all of these factors are seen to have some impact. Each will be examined here in greater detail.

Figure 3 examines the effect of the mother's age on the risk of infant mortality. As seen in this data from 1996, the mother's age has a predictive value for identifying infants with a higher risk for mortality before their first birthday. Live births to women younger than 20 years of age or greater than 35 years of age are more likely to result in an infant

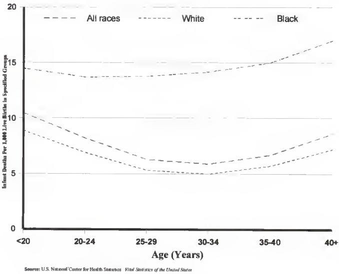


Figure 3 -- Infant mortality rates by age of mother, United States: 1996

mortality than those births to women between 25 and 35 years of age. Morgan (1996) argues that states with an abnormally large group of teen mothers is the greatest predictor of low birthweight births and the resulting infant deaths. This is true across races, although the overall mortality rates for blacks are higher (these findings are constant

across time). Public policy programs have used these findings in several ways. The risk of an infant death has been one of the primary messages used in teenage pregnancy prevention programs. Additionally, this information has been provided to women trying to balance their career and personal lives. As a woman chooses to delay childbirth, she will increase the risk of a live birth resulting in a infant mortality. Public education of these issues are important as women make certain choices in their lives.

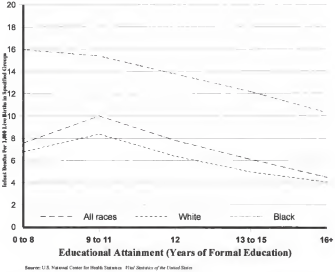


Figure 4 -- Infant mortality rates by educational attainment of mother, United States: 1996

A mother's educational status has also been examined to determine its impact on the risk of infant mortality (Din-Dzietham and Hertz-Picciotto, 1998). Figure 4 shows that the mother's educational attainment (as defined by the number of years of formal

education completed) is inversely correlated with the risk of infant mortality. As educational attainment increases, the risk of infant mortality decreases. Educational attainment's effect on mortality is likely related to the ability of the mother to better understand her prenatal health care needs and the access to resources that come with greater education. In addition, the results are confounded by several other environmental factors. A woman under the age of 20 is unlikely to have more than some college education; the pregnancy, itself, may be the reason for low educational attainment; and a woman with low educational attainment may be plagued by poverty and the devastating factors associated with it. Finally, the reduction in risk associated with higher maternal educational attainment has been found to be of less significance for blacks, possibly indicating diminishing returns on educational investment for this population (Din-Dzietham and Hertz-Picciotto, 1998).

One of the most frequently studied factors affecting the risk of infant mortality is the mother's use of tobacco during pregnancy. Smoking during pregnancy greatly increases the risk of infant mortality. Figure 5 demonstrates that women who smoke during pregnancy are twice as likely as those who do not smoke of having a live birth that later results in an infant mortality. As a public policy issue, public health efforts in the United States are heavily focused on educating women about the risk of smoking during pregnancy.

Another factor having a significant effect on reducing infant mortality is a woman beginning prenatal health care during the first trimester of her pregnancy. Much of the public health efforts around the prevention of infant mortality is focused on educating women about the need for early prenatal care and providing access to these services for

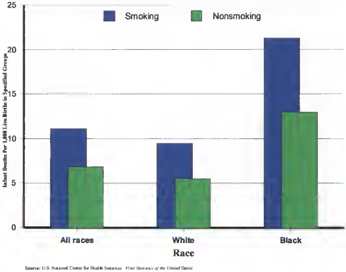


Figure 5 -- Infant mortality rates by smoking status of mother, United States: 1996

women unable to afford the health care in the private sector. Figures 6 shows the devastating effects of late or no prenatal care. As this data indicates, infant mortalities are three to four times more likely to occur if no prenatal care is utilized. For black women, the risk of an infant mortality increases between four and five times if no prenatal care is provided. The importance of these findings receives significant attention from many health professionals, public policymakers, and women of child-bearing age.

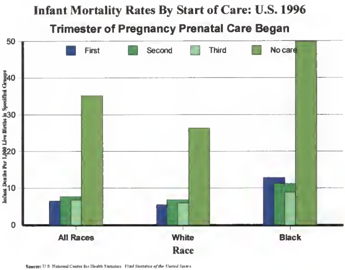


Figure 6 -- Infant mortality rates by trimester when prenatal care began, United States: 1996

Figure 7 demonstrates that educational efforts advocating early prenatal care seem to be effective in encouraging women to seek early prenatal care. The percentage of women receiving late or no prenatal care in the United States is at its lowest point in history. The proportion of women beginning prenatal care in the first trimester and continuing regular visits throughout their pregnancies has increased between 1981 and 1995, with more than 23 million prenatal visits occurring in 1995 (Kogan et al., 1998). Many of the public health initiatives associated with pregnancy have the promotion of early prenatal care as one of their main objectives. This apparent success, unfortunately, has not resulted in lowered rates of poor birth outcomes. This draws attention to a

paradox that will be discussed later in this research: interventions are being used but poor birth outcomes remain the same or are getting worse.

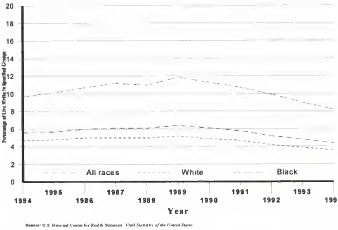
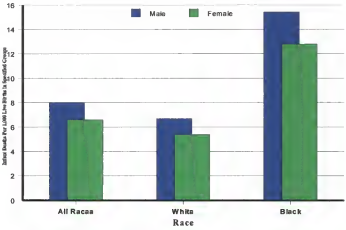


Figure 7 -- Percentage of live births with late or no prenatal care, United States: 1984-1994

In addition to factors associated with the mother, there are many factors related to the pregnancy and the infant, itself, there are associated with increased risk of infant mortality. One of the factors is the sex of the infant. Research is still inconclusive about why there is a difference between male and female infants' respective risks for mortality, but the risk is present across time and races. Although it is a small difference, male infants are at a statistically higher risk for death before one year of age (see Figure 8).

The infant's sex may have only a slight impact on its risk for infant mortality, but other infant factors have some of the most significant impacts on this risk. Figure 9 shows how one of these factors, short gestational age, may cause one of every two live births to result

in infant death. Across races, infants that are born at less than 28 weeks of gestational age (calculated as the number of weeks since the start of the last menstruation), have almost a 50% chance of dying before its first birthday. The survival rate increases dramatically after this point, as seen by Figures 9 and 10.



Source: U.S. National Center for Health Statistics *Vital Statistics of the United States*

Figure 8 -- Infant mortality rates by sex of infant, United States: 1996

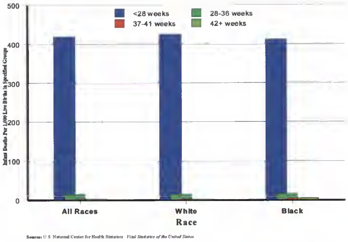


Figure 9 -- Infant mortality rates by period of gestation, United States: 1996

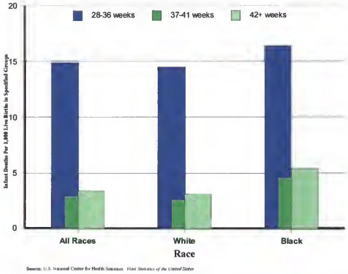
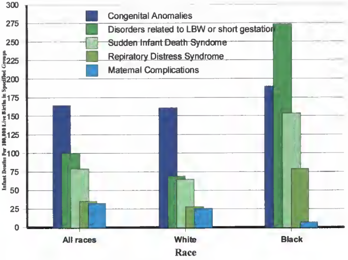


Figure 10 -- Infant mortality by period of gestation > 26 weeks, United States: 1996

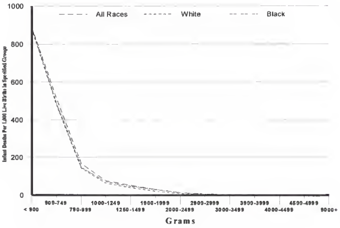
So, whicb factors have been found to have the most significant impact on infant mortality? Figure 11 illustrates the five most common causes of infant mortality. Congenital anomalies, or birth defects, are the primary cause of death for most infants; however, this is not true across races. Within the black population, disorders related to low birthweight birth or short gestation are the primary cause of infant mortality. Across all races, low birthweight births and short gestation (premature birth) occur in 11% of all pregnancies and are responsible for the majority of infant deaths in the neonatal period (less than 28 days after birth) (Adams, 1995; Goldenberg and Rouse, 1998). For all races, sudden infant death syndrome (SIDS), respiratory distress syndrome (RDS), and conditions related to maternal complications round out the main causes of infant mortality (Singh and Yu, 1995).

The effects of low birthweight births on the chance of infant mortality is an important relation. When mortality rates are adjusted for factors such as social class, maternal age, parity, and race, the greatest predictor of infant mortality is birth with a low birthweight [less than 2,500 grams (or 5 lbs. 8 oz.) at birth] or a very low birthweight [less than 1,500 grams (or 3 lbs. 5 oz.) at birth] (Newberger et al., 1976). Births under 500 grams have over a 90% mortality rate and infants born under 1,000 grams account for between 50 and 60% of all neonatal deaths (Goldenberg and Rouse, 1998). The risk of infant mortality for those infants with low birthweights between 1,000 and 1,500 grams has decreased from around 50% in 1960 to about 5% in 1997. After birthweights of 2,500 grams, the risk of infant mortality reduces sharply until the trend begins to climb again with very high birthweights (exceeding 4,500 grams) (see Figures 12 and 13).



Source: U.S. National Center for Health Statistics *Vital Statistics of the United States*

Figure 11 -- Infant mortality rates by leading causes of death, United States: 1996



Source: U.S. National Center for Health Statistics *Vital Statistics of the United States*

Figure 12 -- Infant mortality rates by birthweight, United States: 1996

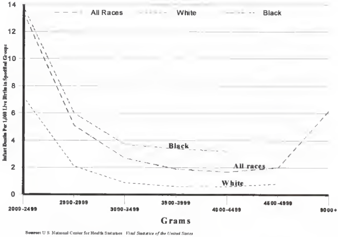


Figure 13 -- Infant mortality rates by birthweights > 2, 000 grams, United States: 1996

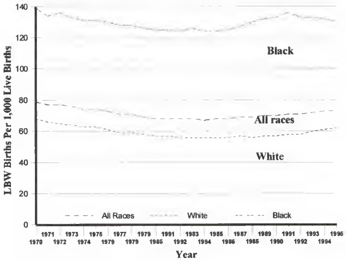
Low birthweight births are usually categorized into two broad categories: preterm births and small-for-gestational age births. Preterm births are those births that occur before the end of the 37th week of gestation. Preterm births can further be divided into two categories: spontaneous preterm births and non-spontaneous preterm births (Goldenberg and Rouse, 1998). Preterm births are a serious problem in the U.S. with approximately 74% of all neonatal deaths occurring among preterm infants (Adams, 1995). Spontaneous preterm births are those births that follow both spontaneous labor and spontaneous rupture of the membrane. To date, the best predictors of spontaneous preterm births are: 1) a previous preterm birth; 2) black race; 3) low maternal height/weight ratios (i.e., the mother being underweight for her height); 4)bacterial vaginosis; 5) fetal fibronectin in the vagina or cervix; and 6) a short cervix a determined by

ultrasound (Goldenberg et al., 1998). Non-spontaneous preterm births occur when a medical care provider decides that continuing the pregnancy would result in unacceptable risk for either the mother or fetus or both. The most common reasons for non-spontaneous preterm births are preeclampsia and presumed fetal growth restrictions. Another form of low birthweight births are small-for-gestational births. These births have birthweights lower than the 10^{th} percentile for any gestational age based on some standard population (Goldenberg, 1994). This condition usually results from a congenital anomaly or from a slowing or temporary interruption of intrauterine growth.

How prevalent are low birthweight births in the United States? As of 1994, 788 babies a day were born with a birthweight under 2,500 grams (March of Dimes, 1997). Figure 14 illustrates the pattern of low birthweight births by race in the U.S. between 1970 and 1995. As shown in Figure 14, the difference between whites and blacks remains pronounced over the years examined; however, since 1990, black low birthweight birth rates have attained a steady decline while white low birthweight rates have begun to slowly increase from the all-time-lows seen during the 1980s.

The Impact of Low Birthweight Births

The most significant impact of a low birthweight birth is the death of the infant. Low birthweight and preterm births (which are usually born with LBW) occur in between 7% and 15% of all births (depending on the population), yet they account for between 60% and 85% of all infant mortalities; 50% of long-term neurological morbidity has been attributed to these births; and .5% to 1% of very preterm births (those born at less than 28 weeks gestation and less than 1,000 grams) account for 50% to 60% of all neonatal mortalities and about one-third of the long-term morbidity (Goldenberg, 1994). There



Source: U.S. National Center for Health Statistics *Vital Statistics of the United States*.

Figure 14 -- Low birthweight birth rates in the United States: 1970-1995

are many other long-term effects for an infant born with a low birthweight. Low birthweight births are more likely than other births to have both medical and development problems. Low birthweight births are more likely to have medical problems such as: respiratory problems (due to underdeveloped lungs); saline imbalances (causing possible brain damage); hypoglycemia (low blood sugar); jaundice skin (which indicates liver problems); iron deficiencies resulting in anemia; low body fat ratios (which make maintaining body temperature difficult); bleeding into the brain (resulting in brain damage or death); heart problems (the ductus arteriosus, a large artery which allows blood to bypass the fetus' non-functioning lungs during pregnancies, may fail to close after birth); inflammation of the intestine (necrotizing enterocolitis); and poor vision or blindness

(called reinopathy which results from an abnormal growth of blood vessels in the eye). In addition to these medical problems, low birthweight infants tend to have learning and other developmental problems.

Finally, there are immediate and extreme financial costs associated with childbirth and especially with treating high-risk pregnancies and preterm/low birthweight births. Health care associated with childbirth is one of the primary costs in the U.S. health care system. The care associated with childbirth (or "perinatal care") includes: prenatal care, delivery services (those provided to the mother at delivery), newborn care (services provided to the infant from birth to the initial hospital discharge), and infant care (care delivered from the initial discharge through the first birthday) (Long et al., 1994). The perinatal care for each mother-infant pair averages approximately $7,000 per event for an overall cost of more than $30 billion annually in the U.S. Research has indicated that for every $1.00 dollar spent on prenatal care in the U.S., there are corresponding savings of between $1.70 and $3.38 (this research makes a number of significant assumptions that have been questioned in later studies) (Huntington and Connell, 1994). Feldman and Wood (1997) found that high-risk pregnancies and the resulting births used a mean of $20,933 (Mean +/- 1 SD of $38,391) in perinatal care, as compared to lower risk births with a mean perinatal cost of $7,624 (Mean +/- 1 SD of $14,454). While low birthweight births represent approximately 7% of all births in the U.S., they represent over 35% of perinatal health expenditures or an additional $15,000 per birth (Becker et al., 1998). Many public health prevention programs have justified their creation and continuing funding with these cost-savings arguments.

Causes of Low Birtbweight Births

There are many factors that have demonstrated an association witb increased risk of low birtbweight births and, not surprisingly, many of these factors are similar to the factors that affect infant mortality. By 1988, over 40 factors had been identified whicb increase the risk of LBW, many of which are preventable and/or treatable (Sepkowitz, 1994). Technically, the primary causes of LBW births are preterm labor in developed countries and intrauterine growtb restriction (IUGR) in underdeveloped countries; bowever, these conditions have underlying etiologies that must be taken into consideration when looking at LBW (Sprague, 1993). Environmental factors sucb as mother's socioeconomic status, age, and utilization of prenatal care have all been associated witb variations in birthweight. Additionally, conditions related to tbe pregnancy are also factors that have been identified to explain low birthweight births. These conditions include congenital anomalies, multi-fetal pregnancies (twins, triplets, etc.), problems caused by placental attachment, and the mother's general health (including blood pressure, diabetes, vaginal/intrauterine infections, organ problems, or a structurally abnormal uterus/cervix). For classification purposes, the principle risk factors for low birthweight births include: demographic variables; maternal medical risk predating pregnancy; maternal medical risk in current pregnancy; maternal behavioral and environmental risks; and health care services access risks (Sprague, 1993).

Demographic variables

There are many demographic factors that have been associated with increased risk for low birthweight births. Women less than 17 or greater than 34 years of age have increased risk for LBW births. Morgan (1996) argues that the single greatest predictor of

a community's LBW rate is the proportion of pregnant women under the age of 18 relative to the overall pregnant population. Race is a factor in LBW risk. In the U.S., a baby born to black mother is three times as likely to suffer from LBW than white infants and conditions relating to short gestation and LBW are consistently the primary cause of infant mortality for black infants (Children's Defense Fund, 1992, Sprague, 1993, March of Dimes, 1997). Marital status is a factor with unmarried women being at higher risk for LBW births. Low educational attainment is associated with a higher risk of LBW births, although blacks do not seem to obtain the same preventive benefit from increased education as their white cohorts. Although each of these individual-level factors are continually found to be associated with LBW risk, some researchers have argued that larger, social risk factors may be just as important. These authors argue that macrolevel social factors in the community in which the mother lives and works (i.e., per capita crime, unemployment rates, average wealth, per capita income, etc.) have a significant impact on the amount of risk for LBW births (O'Campo et al., 1997; Roberts, 1997). If this is accurate, it suggests that larger community interventions may be necessary to address this issue.

Maternal medical risks predating pregnancy

Certain medical histories may indicate a propensity for the mother to have an infant born with LBW. Parity, or the number of previous live births to a particular woman, may indicate whether the woman is likely to have an infant born with LBW. Women with no previous live births or who have more than four previous live births are at increased risk for LBW in future births. Genitourinary anomalies/surgery is related with an increased risk of LBW births. The presence of certain chronic conditions (i.e., diabetes, chronic

hypertension) can increase the risk of a LBW birth. Nonimmune status for selected infections (i.e., rubella) may increase the risk of a LBW birth primarily because the mother has no protection from this illnesses which are known to have damaging effects on fetal growth. The presence of a poor obstetrical history (i.e., previous preterm labor, previous LBW births, infant mortalities) may indicate a propensity for poor birth outcomes in the future. Finally, maternal genetic factors (i.e., LBW at own birth) may increase the risk of a LBW birth.

Maternal medical risk in current pregnancy

Certain maternal conditions occurring during the current pregnancy are useful indicators of an increased risk for low birthweight birth. Poor maternal weight gain during pregnancy is associated with higher incidence of LBW births. Women are two to three times more likely to have a LBW birth if they gain less than 10 kg (or 22 lbs.) during pregnancy (Sprague, 1993). Because black women in the U.S. are twice as likely to gain less than 16 lbs. during pregnancy, this factor is seen as one of the reasons for the discrepancy between white and black birth outcomes. Short interpregnancy interval, the time period between pregnancies, are associated with higher risk for LBW. Women who space their children less than one year apart are more likely to have an infant born with LBW. Hypotension, a condition in which the arterial blood pressure is abnormally low, and pregnancy associated hypertension (preeclampsia), a condition in which there is an elevation of arterial blood pressure beyond a normal range, are both associated with LBW births. Preeclampsia , is related to certain conditions in pregnancy that are responsible for most cases of induced preterm labor often resulting in LBW. Selected infections [i.e., symptomatic bacteriuria, rubella, and cytomegalvirus (a form of the herpes virus that can

cause birth defects)] contracted during the pregnancy can increase the risk of LBW births. Problems with the placenta (i.e., placental previa, abruptio placentae) are factors also associated with an increased risk of preterm labor and LBW births. Severe vomiting early in the pregnancy, known as hyperemesis, may increase the risk of LBW. Abnormally low or high levels of amniotic fluid (known as oligohydramnios and polyhydramnios) may indicate poor fetal growth or birth defects which will likely result in LBW birth. Anemia, or other hemoglobin problems, is associated with LBW births. Isoimmunization, the development of antibodies to the developing fetus, is associated with LBW. Finally, a structurally-abnormal uterine or cervix ("incompetent cervix") may increase the risk of preterm labor and subsequent LBW.

Maternal behavioral and environmental risks

Many maternal behavioral and environmental factors are associated with a higher risk of preterm labor and LBW births. One of the most significant risk factors for LBW birth is the mother's use of tobacco during pregnancy. According to the U.S. Surgeon General, in 1990, between 17% and 26% of all LBW births in the U.S. are attributable to maternal smoking, on the basis of the average prevalence of smoking during pregnancy and the overall relative risk of LBW birth for smokers (Barnett, 1995). Smoking greatly increases the risk of retarded fetal growth and subsequent LBW birth and is the most clearly established preventable risk factor associated with LBW (Sprague, 1993; Hellerstedt et al., 1997). One study in Britain found an average difference in birthweights between smokers and nonsmokers of 241 grams at birth (Brooke et. al., 1989). Because this effect has been demonstrated in non-smoking pregnant women exposed to significant amounts of "second-hand" smoke, the effect may even be larger if they are controlled for

in the comparison (Nafstad et al., 1998). Nicotine and carbon monoxide produced in tobacco smoke contribute to chronic lack of oxygen to the uterus causing a reduction in fetal growth (Sprague, 1993). The use of alcohol is also associated with fetal growth problems and LBW birth. The reasons for this effect may include: 1) alcohol freely passes to the fetus in concentrations equivalent to that in the mother's blood stream; 2) fetal elimination of alcohol is less efficient, especially in the first trimester; and 3) placental dysfunction is common in women who abuse alcohol (Sprague, 1993). The use of other drugs during pregnancy increases the risk of birth defects and LBW births. The use of certain drugs, cocaine for example, has been widely reported in certain areas (e.g., inner city hospitals) with up to 45% of pregnant women using illicit drugs (Kline et al., 1997). How substance abuse negatively affects fetal development is unclear and confounded by environmental and behavioral factors that in themselves are correlated with an increased risk of LBW. For example, it is unlikely that a pregnant woman using cocaine is only using this substance; it is unlikely that she will enter early prenatal care for fear of detection; and it is unlikely that she will adhere to a balanced diet. A factor closely associated with alcohol and substance abuse is violence toward the pregnant woman and her fetus. Various studies indicate that between 1% and 20% of women experience physical violence during pregnancy, as compared to between 9.7% and 29.7% in the female population as a whole (Ballard et al., 1998). Women who are abused are less likely to access prenatal care, are more likely to have multiple injury sites, and have significant abuse directed to the abdomen. Poor nutrition has been associated with increased risk of LBW, in particular the deficiency of certain minerals and vitamins. While it is known that certain vitamins and minerals (i.e., folic acids, iron, zinc) are important during pregnancy,

the necessary amount of nutrients and the timing of their introduction is still unclear. In general, caloric intake in itself seems to be as important as the dietary level of any particular vitamin or mineral. Psychological conditions (i.e., stress, anxiety, depression) are also associated with a higher risk of LBW. The theories behind the effect of psychological factors on pregnancy are rooted in the understanding of the role of catecholamines (the hormones that are released during stress causing the "fight or flight" response) in the body (Sprague, 1993). The belief is that these hormones can cause early uterine contractions and impaired fetal growth. Finally, several other external factors have been associated with increased chance of preterm labor including: high heat-humidity index; working conditions; physical activity (exercise), etc. (Lajinian et al., 1997).

Health care services access risks

The inability or lack of desire to access early, comprehensive prenatal care has been associated with an increased risk of LBW births. Research continuously demonstrates that there is a positive linear association between month of initiation of prenatal care and low birthweight rates. Low birthweight rates increase as the month of pregnancy when prenatal care began increases. Furthermore, there is a inverse correlation between the number of prenatal visits received and low birthweight rates. As the number of prenatal visits increase, low birthweight rates decreases (Kotelchuck, 1994). Proponents argue that early and regular prenatal care provides opportunities to: 1) identify certain maternal risks; 2) educate the woman about environmental and behavioral risk factors; 3) implement specialized care, and 4) detect preterm labor at an earlier point. Considerable resources have been put into the provision of prenatal services and it is a component of most social programs to reduce infant mortality and poor birth outcomes

rates. However, the substantial increase in private and public spending for prenatal care over the last two decades has not resulted in substantial decreases in the birth outcomes rates, resulting in a paradox (Mustard and Roos, 1994; Sepkowitz, 1994)). Research is still unclear about what particular aspects of prenatal care are most essential. Kogan et al. (1994) found that women who reported receiving insufficient health behavior advice as part of their prenatal care were at higher risk for a LBW birth. In another study, researchers indicated that the physician's qualifications and experience has an impact on birth outcomes (Haas et al., 1995). Still other research has shown that the woman's proximity to the obstetrical care, irrespective of actual utilization, has an impact on LBW births with rural women who travel out of town to receive the care have poor outcomes (Nesbitt et al., 1990; Nesbitt et al., 1997). Differences in the ability or desire to access health care services has been indicated as a possible explanatory factor for the racial disparity in poor birth outcomes. In one study, 63.4% of white women received adequate prenatal care as measured by the Prenatal Care Utilization Index compared with only 51.9% of black women (Kotelchuck, 1994). In fact, black women are less likely to practice primary preventive health behaviors than white women in general (Duelberg, 1992). As with many risk factors examined, research on prenatal care utilization and birth outcomes is hindered by methodological problems. One of the key problems is that there are differences in the way women seek and use prenatal care, and these differences are not random and are difficult to measure (Frick and Lantz, 1996; Liu, 1998). Since, for ethical reasons, we are unable to conduct randomized control studies assigning women to different levels of utilization, conclusive link to improved birth outcomes may never be known. As a result, a public health policy that heavily relies on the promotion of prenatal

care utilization to reduce the incidence of LBW births does not have conclusive empirical support.

Medical and Psychosocial Interventions

Many interventions have been developed with the hope of reducing low birthweight births and the resulting infant mortalities. These interventions can usually be divided into one of three categories: medical, psychosocial, or a combination of interventions. The medical interventions include: utilization of prenatal bealth care; surgical interventions to prevent preterm births; pharmaceuticals to stop preterm labor; nutritional interventions; bed rest and hydration; and efforts to reduce vaginal infections. Psychosocial interventions include: risk-based scoring systems to determine service needs; cessation programs for tobacco, alcohol, or other drugs; psychological services to reduce stress, anxiety, and/or depression; and economic assistance programs. Each of these interventions need greater description in order to understand tbe rationale for using the intervention.

Medical Interventions

The use of medical interventions to address problems in birth outcomes are often referred to as a "medical-model" approach. (Sprague, 1993). The medical-model approach assumes that poor birth outcomes can be eliminated through medical interventions at the individual level. While this model acknowledges that there are social factors that increase the risk of a poor birth outcome, it advances the use of medical technology, pharmaceuticals, and information transfer in the provider-patient relationship as the appropriate venue for reducing these risks.

Early and comprehensive prenatal care is the cornerstone of the medical-model approach to reduce the risk of low birthweight births. The basis for this approach is research that indicates that women who receive early prenatal care or have more prenatal visits are less likely to have a low birthweight birth. Additionally, the Institute of Medicine estimates that for every dollar spent on prenatal care there is a corresponding savings of $3.38 resulting from the reduction of medical cost associated with low birthweight births (Children's Defense Fund, 1992). The medical care required to care for an infant born in the U.S. cost an average of $2,500 per day, or approximately $8,000 per neonatal intensive care unit admission (Sprague, 1993). Although the correlation between late or no prenatal care and increased LBW births has been repeatedly demonstrated, this is not to say that there is a *causal* link between early/extensive prenatal care and birthweight. Goldenberg and Rouse (1998) conducted an extensive review of prenatal care interventions that changed the inception or intensity of prenatal care and found little impact on LBW rates. The authors concluded,"...because the enhancements to prenatal care have varied from study to study and because the associated reductions in preterm births have been inconsistent, it is not clear which specific additions to prenatal care, if any, are likely to result in a reduction in preterm births." Other researchers conducting meta-analyses of the research literature on prenatal care and low birthweight have concluded that early prenatal care has not consistently reduced the incidence of fetal growth retardation, very low birthweight, or very preterm delivery (Alexander and Korenbrot, 1995). They conclude by stating that changes in provider practice patterns and public policy are needed to allow the full benefit of early pregnancy prevention to be realized.

Surgical interventions (cervical cerclage) are sometimes used to prevent preterm delivery. Between 1 in 200 and 1 in 1,000 pregnant women are diagnosed with a structurally weak, or "incompetent", cervix. This diagnosis is usually based on a medical history of spontaneous second-trimester birth without the detection of uterine contractions. In later pregnancies, the physician may choose to place one or more circumferential stitches (cerclage) in the cervix. Although common, research has been unable to conclusively determine the effectiveness of the procedure because the histories of women undergoing the procedure are difficult to differentiate between an incompetent cervix or unrecognizable preterm labor (Goldenberg and Rouse, 1998).

Nutritional interventions are often used to reduce the risk of a LBW birth based on research demonstrating that women who are underweight at the beginning of pregnancy and those who gain little weight during the pregnancy are at increased risk for preterm birth and LBW (Goldenberg and Rouse, 1998). These interventions usually involve a combination of: counseling; protein supplementation; caloric supplementation; and vitamin and mineral supplementation. Little proof exists to show that nutritional counseling affects the eating behaviors of pregnancy women and even less evidence that it prevents preterm births or LBW. Contrary to research showing that women with low-protein diets are at higher risk for preterm births, programs that promote protein supplementation often result in adverse outcomes. One of the most prominent U.S. programs designed to prevent preterm births and LBW births is the Special Supplementation Program for Women, Infants, and Children (WIC). The basis of the program is to provide calorically-enriched diets to low income pregnant women. This, and similar programs, have demonstrated small increases in birth weight. These programs do not tend to prevent

preterm birth, but do effect fetal growth. Finally, vitamin and mineral supplementation interventions are based, once again, on research demonstrating that anemia, low maternal zinc blood levels, the absence of folic acid from maternal diets, and other vitamin deficiencies are associated with congenital anomalies, retarded fetal growth, LBW, and preterm births. Programs supplementing vitamins and minerals have had mixed results, often depending on the initial deficiencies of the pregnant woman.

Tocolytics, a class of pharmaceuticals, are used to interrupt or stop uterine contractions in the event of spontaneous preterm labor (Goldenberg and Rouse, 1998). These drugs include: beta-mimetic agents; magnesium sulfate; calcium-channel blockers; oxytocin antagonists; and nonsteroidal anti-inflammatory agents. Although widely used, these drugs have only been shown to effective for a relatively short period of time (approximately up to 48 hours). With such a temporary interruption of preterm labor, what is the benefit of using these interventions? Most health care professionals agree that tocolytics, alone, are beneficial for "buying" the extra time necessary to transfer the mother to a facility specializing in methods to care for preterm deliveries (Sprague, 1993; Bronstein et al., 1998). Benefits are also gained when tocolytics are used in conjunction with corticosteroids (hormones that help the lungs work more effectively). The most commonly used corticosteroid for this purpose is surfactant. By 1991, both synthetic and animal surfactant were approved for use in the United States (Strobino et al., 1995). The tocolytic agents may help increase the antenatal period long enough for the corticosteroids to reduce the risk of neonatal respiratory distress syndrome, intraventricular hemorrhage,

and the resulting neonatal mortality. Additional randomized studies are needed to prove the effectiveness of the using these drugs in coordination[3].

Bed rest and hydration has been advocated for years for women facing preterm labor. Like many of the other interventions discussed, bed rest and hydration has little evidence to support it as an effective intervention during preterm labor. Ironically, as with many of the other commonly used techniques, research has demonstrated that there may actually be an increased risk of preterm labor for women using this intervention. In addition, pregnant women proscribed bed rest are at increased risk for other adverse outcomes including venous thrombosis and pulmonary edema (Goldenberg and Rouse, 1998).

Treatment of vaginal and intrauterine infections is another intervention based on research showing women with certain infections are at increased risk for preterm labor. Up to 80% of preterm births are associated with the presence of vaginal and/or intrauterine infections, although programs designed to introduce antibiotics in women with histories of preterm labor have proved ineffective in preventing early labor in later pregnancies (Goldenberg and Rouse, 1998). Irrespective of supporting evidence, interventions to reduce infections are becoming more common in prenatal care programs.

Psychosocial Interventions

In the last two decades, there has been a movement away from a purely "medical-model" approach to preventing poor birth outcomes to a more holistic approach that

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[3]The use of tocolytics and corticosteroids have been indicated as factors explaining the reduction of infant mortality rates in the U.S. However, while infant mortality rates are declining overall, white mortality rates are improving at a faster rate than blacks. Recent research indicates that differences in the use of these drugs may be the reason for the growing disparity between whites and blacks with African American

includes psychological and social (psychosocial) interventions. Rosenblatt (1989) argues that the medical model is ill-suited for large social problems like low birthweight births. Additionally, he argues that because our current obstetrical style uses a "maximin approach" (manage the patient to prevent the worst possible outcome), the care focuses attention on the search for deviation from the physiological norm and diverts attention away psychosocial interventions that may be more appropriate. These interventions usually include cessation programs, psychological counseling, economic assistance, family planning, domestic violence prevention, and home visits by health or social workers professionals.

Cessation programs for tobacco, alcohol, or other drugs are often advocated for the prevention of low birthweight births, and most psychosocial intervention programs include cessation programs. Research has demonstrated that as the overall prevalence of smoking declines in the population, there is a corresponding decrease in LBW rates (Cnattingius and Haglund, 1997). While the use of these substances during pregnancy is linked with restricted fetal growth and congenital anomalies, the effectiveness of these programs in reducing low birthweight births at the individual level has not been shown. Part of the problem in determining program effectiveness in reducing poor birth outcomes is that they often result in low cessation rates. Persons using these substances during pregnancy rarely stop completely, although some do reduce their use. This is especially true for tobacco cessation programs. Psychological services to reduce stress, anxiety, and/or depression are also included under many psychosocial intervention programs. The provision of these services is based on research that indicates that women with unusual

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mothers and infants less likely to receive the interventions. The reason for the disparity in drug utilization

stress, anxiety, or depression have an increased risk of low birthweight births. Like many of the other interventions, research has failed to demonstrate that these interventions help reduce the overall rates of preterm birth or low birthweight births. Finally, economic assistance programs have been advocated as a way to ensure women receive many of the previously mentioned psychosocial interventions through the private sector if public assistance interventions are not available or limited. Unfortunately, research indicates that economic assistance programs, and psychosocial interventions as a whole, do not seem to have a positive impact on poor birth outcome prevention (Villar et al., 1992; Sepkowitz, 1994).

Combined Medical and Psychosocial Interventions

Because of the correlation between the various factors associated with preterm labor and LBW births, many of the programs designed to reduce the risk of both often include a wide variety, if not all, of the intervention discussed in this section. Many of these programs are based on either a "risk-scoring" system or a community-wide "full-population" approach in order to determine resource allocation.

Risk-scoring systems, where either self-reported factors are collected through a special survey instrument or information is obtained during the initial prenatal visit, are often used to determine how many factors correlated with increasing the risk of low birthweight births are present for a given pregnancy. Each factor identified is usually given a weighted value (i.e., smoking status may have a higher score than mother's age) and a score is determined. These systems usually have a scoring "threshold" under which the pregnancy is seen as having a low risk for LBW and under which expanded services or

patterns is still unknown (Bronstein et al., 1998).

interventions are not offered. Conversely, scores that surpass the threshold indicate a significantly higher risk of poor birth outcome and usually qualify the mother for special assistance considered essential to reduce this risk. In general, these systems tend to have the problem of identifying too many women as high-risk who do not eventually have a LBW birth, and fail to identify many women who are not considered high risk and yet have a LBW birth (Sprague, 1993). After reviewing these systems, Goldenberg and Rouse (1998) argue that they tend to consistently identify those pregnancy with two or more times the risk of a normal pregnancy but offer little in ensuring better health outcomes. The authors go on to argue that scoring systems seem to only increase the use of interventions with unproven effectiveness or the use of unwarranted interventions at a high financial cost and possible negative impact.

Full-population programs are focused at community-level interventions. Proponents of the community-based intervention programs argue that it is more logical to affect larger societal and environmental factors in preventing LBW births, than directing increased resources to a particular individual. These proponents use an analogy called the "upstream-downstream" model to describe the benefits of a community-wide approach (Sprague, 1993). The upstream-downstream model describes a problem of a river in which persons continually fall in and need saving. To solve this problem, three points of intervention could be utilized. First, rescuers can rush into the water to save the individual as they come downstream, using whatever resources are needed, many which are very expensive. This is the equivalent of treating LBW infants after birth to prevent potential mortality. The second intervention point is to go upstream to the point where people are falling into the river and either teach the people how to swim or catch them before they

fall into the water. This is equivalent to identifying and providing services to high-risk women through the risk-assessment programs. Finally, the third intervention point is to either fix the bank where people are slipping in, build a barrier between the walkway and the river, or build a bridge over the river to help people cross. In doing so, the community is provided with protection and people, irrespective of their risk, benefit equally from this intervention. The third point of intervention is the equivalent of the community-wide interventions for preventing LBW births. Community-wide interventions to prevent LBW births usually support universal screening of pregnant women for risk factors and allow all women to access any services provided. The belief is that all women can benefit from the services and that a broad approach to interventions will capture pregnancies that would have been categorized as "low risk" yet which may result in LBW births. Because until recently the medical model of interventions has been the primary choice in the U.S., there has been little research examining the effectiveness of community-wide approaches. What is known is that the U.S. continues to expend considerable resources to prevent preterm/LBW births and yet conditions remain the same or have worsen within some populations.

The Perinatal Paradox

Before examining federal and state approaches to coping with poor birth outcomes, it is important to summarize the paradox that is presented by the current research on this issue. Research on the causes of LBW birth and the interventions that have been developed to combat the problem make it clear that there is a disconnect between the knowledge and the implementation of the interventions. This disconnect has been noticed by other experts as well and called the "perinatal paradox" (Rosenblatt,

1989; Sepkowitz, 1994; Goldenberg, 1994; Kliegman, 1995; Kramer et al., 1998). Many researchers and child health policy advocates point out that although the amount and types of interventions have increased, birth outcome indicators remain the same year to year, and indicators for some populations have worsened. While expenditures for obstetric and neonatal care continues to rise, neonatal intensive care units (NICU) continue to proliferate, and regionalized perinatal care programs become commonplace, poor birth outcomes continue (Rosenblatt, 1989). Goldenberg states ". . .despite the utilization of ever increasing amounts of research and clinical care resources aimed at achieving a reduction in low birthweight, there is limited evidence to date that any intervention or practice has had a major impact on preventing preterm birth or growth retardation. . .neither the behavioral [psychosocial] approaches (smoking or drug cessation programs, nutritional counseling or supplementation, provision of social support, etc.) or medical approaches (enhanced prenatal care, tocolytic agents, etc.) adopted to date have had a large or even statistical impact on the rate of preterm birth or growth retardation" (1994, p. 630).

Most research that has demonstrated a change in infant mortality rates attributes the change to preterm infants' increased chances for *survival*, not in the overall reduction of LBW or preterm labor rates. In fact, research indicates that neonatal technology has been a driving factor in perinatal survival. More than 35 studies have shown that the use of certain corticosteroids reduces the chance of infant mortality by between 30% and 40%. Up to 60% of infant mortalities attributed to respiratory distress syndrome have been eliminated with their use. The primary corticosteroid intervention, exogenous surfactant therapy, "consists of artificial or animal-derived surfactant (a combination of lipids with

surface tension-lowering properties) being administered through an endotrachael tube directly into a newborn's lung, usually within minutes of the birth"(Kliegman, 1995). Kramer et al. (1998) suggest that the increasing poor birth outcomes rates are actually related to changing medical practices. The authors look at preterm births in a Canadian hospital over a eighteen-year period beginning in 1978. They found that the increased rates of premature births were "largely attributable to the increasing use of early ultrasound dating, preterm induction and preterm cesarean delivery without labor, and changes in sociodemographic and behavioral factors."

In summary, the "perinatal paradox" appears to be the result of three interacting phenomena. First, multiple preventive interventions are being used more widely than ever before, although there appears to be little evidence that any of these interventions have had any impact on preventing preterm or LBW births. Second, what reduction in poor birth outcomes have been identified seem to be related to survival rates of preterm/LBW infants, rather than prevention efforts. Finally, physicians and other medical providers appear to be willing to risk premature, induced labor in certain pregnancies because of the availability of medical interventions which increase the survivability of these infants (Joseph, et al., 1998). If these assumptions are accurate, it is unlikely that poor birth outcome rates will decrease in the future (irrespective of preventive interventions used in society) as even more technological developments allow infants to survive at smaller birthweights and extreme prematurity.

Programs to Reduce LBW Births: National and State

As previously discussed, the prevention of LBW births and the resulting infant mortalities have been primary health policy issues in the U.S. for decades. This being the

case, there is still a long way to go. Every day in the United States, 81 infants die, 443 infants are born to mothers who had late or no prenatal care, and 781 infants are born with a birthweight under 2,500 grams. With these statistics, it is understandable why intervention programs are continuously created and maintained as a primary public health policy issue. This section examines the history of child health programs in the U.S., the current federal intervention programs, and similar state policy innovations dealing with poor birth outcomes.

Early Federal Intervention Programs: Turn of the Century

Poor birth outcome rates, while still considered a serious problem in the U.S., are considerably lower than they were at the turn of the century. In 1900, 10% of infants died in the first year of life. The primary causes of infant death at the turn of the century were infectious diseases and diarrhea resulting from poor water and sanitation conditions. Urban areas were affected the most with rural infants having a higher chance for survival to their first birthday. Not surprisingly, the first federal and state interventions affecting infant mortality rates involved sanitary reforms in the cities. The resulting decline in infant mortality over the next thirty years was also partially attributed to the pasteurization of diary products, educational programs that taught childcare to new mothers, birth control education (although still illegal in much of the United States) which helped women to space their births, and the development of the first antibiotics and immunizations. In 1921, Congress passed the first federal maternal and child health program, the Sheppard-Towner Maternity and Infancy Act (Cooper, 1992).

Federal Maternal and Child Health Policy and the New Deal: 1935-1953

The next significant change in federal policy resulted from the passage of the Social Security Act of 1935. Part of the "New Deal" programs introduced by the Roosevelt Administration, Title V of the Social Security Act provided grants to the states to improve maternal and child health and Title IV-A included a provision entitled Aid to Dependent Children (ADC). As originally designed, the ADC program provided direct financial support to orphans or children cared for by a widowed mother, or when the father was unavoidably absent from the home. Coupled with the earlier provisions of the Sheppard-Towner Act, these new programs helped states to increase health care system capacity for maternal and child health (Schlesinger and Kronebusch, 1990). Although the Department of Health, Education, and Welfare (later renamed the Department of Health and Human Services) was created and elevated to a cabinet position in 1953, federal health policy related to maternal and child health continued under these programs through World War II and did not receive priority attention again until the social welfare initiatives of the 1960s.

Federal Maternal and Infant Health Policy and the Great Society (1962-1965)

During the 1960s, three of the most important federal policy initiatives related to maternal and child health were created or modified from earlier policies. These policies include: 1) changes in the ADC program; 2) creation of Maternal and Infant Care (MIC) Projects; and 3) the creation of Medicaid. Because most of these programs are partnerships between the federal government and the states, these three programs became the cornerstone of maternal and child health policy in the U.S. Each one of the programs will be discussed in greater detail.

Aid to Families with Dependent Children (AFDC)

More easily recognized as the Aid to Families with Dependent Children (AFDC) program, the ADC program was funded by the federal government and administered by the states. While initially focused on general child welfare, eventually AFDC came to include assistance for medical care, cash financial assistance, and other social services to children in need because of a major family crisis such as divorce or the death, disability, or desertion of a parent. The program, in conjunction with Medicaid, became an important source for support and funding for medical care for pregnant women and children (Miller et al., 1990). Because states determined many of the requirements of the program, there was wide variability among the states in who receives what level of assistance. Many states even allowed pregnant women to apply for AFDC benefits on behalf of the fetus. In addition, only half of the states joined the program prior to 1970, with the number of participating states declining over the years.

The AFDC program expanded twice since its creation. In 1962, the Kennedy Administration proposed and signed into law changes to the Social Security Act expanding eligibility to include payments to the mother in the family and making AFDC a separately-funded program. This first expansion was approved because of the argument that "if assistance is provided only to children, it is inconceivable that the mother or other adult caring for them will forego food or other necessities in order that the money will only benefit the children" (Gray et al., 1990, p. 421). The second expansion occurred in the 1980s allowing payments to go to families with able-bodied, unemployed adult males. As a result of the two expansions, federal eligibility requirements for AFDC stated that an eligible family must have a dependent child who is: 1) under the age of 18; 2) deprived of

parental support because of a parent's death, continued absence, incapacity, or the unemployment of the principal family earner in a two-parent household; 3) living in the home of a parent or other specified, close relative; 4) a resident of a state participating in the program; and 5) a U.S. citizen or an alien permanently and lawfully residing in the U.S.

This second expansion changed removed the program so far from its original purpose that it became an issue of considerable public debate. While originally designed to provide direct financial support for food, housing, and medical care to orphans and children in families without a father, the second expansion of the program allowed payments to family units with unemployed males and those headed by mothers who had the children "out-of-wedlock." For this reason, AFDC became one of the most costly and controversial social welfare program in the U.S. (Bowman and Kearney, 1990). Even in the 1930s, before the more controversial expansions, one legislator from Illinois consistently referred to AFDC as the "aid to bastard children program" (Gray et al., 1990). Critics argued that the people should not receive public funds if they are able to work and funds should not be used to support families in which the men were unwilling to provide support. Other critics argued that the design of the program gave an incentive for married couples to divorce or for couples not to get married in order to obtain or keep their benefits. Finally, opponents to the program believed that its design provides a disincentive for people to look for jobs, because they could lose the benefits yet make less money in the lower-income jobs available to the recipients (Wilson, 1992). Some statistics support these arguments. Between 1964 and 1969, the number of "welfare mothers" grew by more than 60%, and by the 1990s over 90% of AFDC payments were to single-parent households in which the living father was divorced or separated from or never married the

mother (Wilson, 1992; Bowman and Kearney, 1990). The percentage of AFDC children who were recipients because the parents never wed increased from 33.8% in 1977 to 48.9% in 1986 and the percentage of adults receiving assistance that are women was approximately 88% by the end of the 1980s (Gray et al., 1990). The AFDC program continued to be a political "hot-potato" throughout the 1970s and 1980s. With public support for AFDC never high and with support declining rapidly through the early 1990s, the Clinton Administration and the 104th Congress pushed through significant welfare reform in 1996 (P.L. 104-193) effectively eliminating the AFDC program.

Maternal and Infant Care (MIC) Projects

Created in 1963, Maternal and Infant Care (MIC) projects consist of federal funding to states to reduce poor birth outcomes in impoverished, urban areas. The program was designed to provide actual prenatal and maternity services in these areas. These services are provided to eligible pregnant woman and infants up to one year of age. Maternity and medical services provided through MIC projects include: diagnostic and preventive services; nursing assessments; nutritional assessments and counseling; case management; medical exams; physician and nurse midwife visits; family planning services; delivery support assistance; and parenting classes.

MIC projects, at one point, provided some of the most comprehensive, direct service programs available for pregnant women and their infants. MIC projects were not as widespread as later programs (i.e., Medicaid, WIC) and there were only 56 independent projects in the U.S. at the height of the program (Miller et al., 1990). Few of the projects are still in operation today.

Medicaid

Following the first expansion of the AFDC program, the federal government embarked on a more direct approach to provide aid to pregnant women and their infants. In 1965, the Johnson Administration proposed significant amendments to the Social Security Act. These amendments resulted in the addition of Title XIX to the act, commonly called Medicaid. Another joint program funded and administered by both the federal and state governments, Medicaid requires certain basic medical services be provided to low-income individuals including: inpatient hospitalization; outpatient hospital services; laboratory and radiology services; physician services; and maternal care. The program is the primary source of funding for long-term institutional care for the physically and mentally disabled. Specifically related to maternal and infant care, Medicaid provides free prenatal and hospital care, and postnatal care for child and mother if needed. Persons already receiving AFDC or Supplemental Security Income (SSI) are automatically qualified for Medicaid

As part of the federal-state partnership, states have the ability to change eligibility within certain parameters set by the federal government and may select additional benefits not required by the federal government. States may also determine the scope of services that can be offered and may require limited co-payments, deductibles, or coinsurance (Gray et al., 1990). The program also allows certain people who would not otherwise be eligible for public assistance, to receive public assistance for medical care. This optional "medical needy" program is being offered by more than half of the states, and has become the leading provider of perinatal care for low-income women and children.

Federal Programs for Women and Infants and Republican Administrations: 1972-1991

Federal interventions to improve pregnancy outcomes and prevent infant mortality and morbidity were not only Democratic initiatives. Between 1972 and 1991, several changes were made in the existing federal programs and new ones were signed into law by Republican administrations. At the same time, spending by the federal government was shifted to greater administration by the states and declined overall, and many states developed their own programs in response.

Special Supplemental Food Program for Women, Infants, and Children (WIC)

Aimed at reducing malnutrition (a factor linked to low birthweight births and poor maternal weight gain) the Nixon Administration promoted the inclusion of a $20 million amendment to the Child Nutrition Act of 1966. The amendments passed and established the Special Supplemental Food Program for Women, Infants, and Children, or more commonly known as WIC. Administered by the U.S. Department of Agriculture (USDA), the program works through state health departments to distribute food and food vouchers on a monthly basis to pregnant women, nursing mothers, their infants and children up to the age of five. The programs were quickly combined with other programs focusing on maternal and child health. Screening systems in either WIC and one of the other programs usually help to establish eligibility for others. It is not uncommon for pregnant women and their children to be receiving services from AFDC, SSI, Medicaid, and WIC all at the same time.

By 1989, over three million people were enrolled in WIC at a cost of almost $2 billion annually (Miller et al, 1990). In response, the USDA argues that the program has a high return on investment saving as much as $3 in health care expenses for every dollar

spent in WIC (Cooper, 1992). Many studies have examined the impact of WIC in preventing infant mortality have shown the program has limited success (Kotelchuck et al., 1984; Ahluwalia et al., 1998; Moss and Carver, 1998). The program seems to have the most significant benefit for women who are poor, black/or in their teenage years.

There are criticisms of the WIC program. WIC may have helped some women, but overall participation in the program of those eligible is less than one-fourth. Critics argue that this may be related to the social stigma that has become attached to the program. Additionally, critics argue that the program is more an agricultural subsidy than a maternal and child welfare program. The foods directly provided by WIC come primarily from agriculture surpluses. Nutritionists see the value of the foods provided to women and their infant as high in fat (i.e., milk, cheese, etc.) and low in fruits and vegetables. The high fat foods are effective in promoting weight gain in women and infants, but the long-term health effects of a high-fat diet make the program's claim to preventing LBW births of questionable benefit, especially for the mother.

Improved Pregnancy Outcomes (IPO)

In 1976, the federal Bureau of Child Health Services initiated the Improved Pregnancy Outcomes (IPO) program as part of its overall child health strategy. The IPO projects were designed to develop "state-based systems of care for mothers and children." The allocation of the funds to the states is based on the severity of the infant mortality and morbidity rates. The funds were designed to encourage states to upgrade their systems of perinatal care. The first IPO projects were directed to indigent pregnant women trying to help them access comprehensive outpatient prenatal care, delivery services, and postpartum care (Miller et al., 1990). States had considerable flexibility in designing their

programs and some, like Florida, incorporated their existing MIC projects into the new program. Because of their high infant mortality rates compared to other counties in Florida, the following eight counties were selected to receive the funds: Despot, Glades, Hardy, Hendry, Lake, Lee, Marion, and Putnam.

When the federal funds were cut in 1982, the Florida Legislature approved using the state's general revenue funds to support and expand the program throughout the state (Clarke et al., 1993). By 1985, all of the counties in Florida had operational IPO programs. With this expansion of the program in Florida, its purpose was defined as: "the development of health programs throughout the state which improve the health of mothers and children, improve the outcome of pregnancy of mothers and children, and improve the health of newborns, infants, preschool, and school-age children, adolescents and young adults. The mission is to identify, organize, and coordinate all available resources to develop intervention programs which will ultimately result in the prevention of morbidity and mortality in mothers and children" (Miller et al., 1990, chapter 5, p. 6). The basic services provided through this expanded program included: prenatal care provided by nurses, midwives, and physicians; nutritional counseling; parenting classes; home visits; limited delivery arrangements; "well-child" check-ups; family planning; WIC; and immunization services.

The efficacy of these programs in many states has been difficult to determine. Research on the IPO programs in Florida after the state took responsibility for funding has demonstrated that the programs may have only marginal impact on infant mortality (Miller et al., 1990; Clarke et al., 1993). Most research indicates that IPO program have increased the number of prenatal visits that these low-income women receive, however,

there has been little evidence of a corresponding decrease in poor birth outcomes. Some researchers have argued that the programs are effective but that the women are in worse condition than the general population, so comparison of their relative birth outcomes is not valid. The researchers believe that the true impact of the program is "masked" by the poor condition of the women in the program (Miller et al., 1990). However, based upon closer examination of these studies, it could be argued that a larger issues has been overlooked. In order to determine the impact of the program, Miller et al. (1990) and Clarke et al. (1993) created a matched comparison group of IPO participants and other pregnancies with similar sociodemographic characteristics as the IPO group. In comparison, the IPO group has slightly better outcomes. What is assumed by the authors is that the relative risks are the same between both groups (or that the IPO group may have worse health conditions upon entering the program). In reality, it is possible that the comparison would be more likely to have poorer health status. When one considers that members of the comparison group are unlikely to have private health insurance, the question has to be raised as to why they would refuse to participate in a free health program like the IPO program? One possibility is that these individuals have certain health behaviors (e.g., illicit drug use) or other legal issues that may be a deterrent to seeking public health official interventions. These risk factors would appear to put this group at a significantly higher risk for poor birth outcomes.

One finding in Miller et al.'s (1990) study which received no attention in later published research (Clarke et al., 1993) on the IPO program was related to the authors use of time series analysis (ARIMA) to examine changes in the LBW rates. The authors found a seasonal pattern in LBW rates in nonwhite women in Florida. The authors only mention

the finding as part of the methodology discussion. As will be demonstrated later in this research, this phenomena does not simultaneously occur in the white population in Florida. This raises a number of questions because the seasonal differences could relate to increased infant deaths in nonwhite births at certain points of the year.

Maternal and Child Health Block Grants

The Omnibus Budget Reconciliation Act of 1981 was the next significant change in maternal and child health policy. The Act changed many aspects of the Medicaid program including amendments to Title V of the Social Security Act establishing Maternal and Child Health Block Grants for states to provide health care to needy women and children. States were required to provide matching funds equal to 75% of the federal allocation. At the same time, welfare eligibility for the working poor was tightened and many lost Medicaid coverage. During the late 1980s, federal funding for the MCH grant fell by over 40% (when adjusting for inflation). Because of the cuts and the approaching recession, services overall were reduced in most states by the end of the 1980s.

Medicaid Eligibility Expansion

Prior to 1989, states were required to offer Medicaid coverage to pregnant women and young children with a family income less than 133% of the federally-established poverty level ($18,500 for a family of four in 1989). Congress took action based on two primary assumptions: 1) financial limitations produced barriers to prenatal care; and 2) increased prenatal care may reduce the incidence of infant morbidity and mortality (Dubay et al., 1995). As part of the Omnibus Budget Reconciliation Act of 1989, states were allowed to raise the eligibility standard to 185% of the poverty level for pregnant women and their infants. Another expansion of Medicaid in 1991 allowed coverage to expand to

the mother a full 60 days after birth and to her infants up to their first birthday. Florida was one of the first states to expand its program under the new laws.

Because of the structure of the program, approximately 30 million receive some form of Medicaid assistance. Of these, more than half-a-million deliveries are paid for by Medicaid each year, resulting in over $1 billion of costs annually (Miller et al., 1990). Over time, expenditures for their share of Medicaid has become the largest expenditure for states out of their budget. Medicaid expenditures have increased at an annual rate of 6.2% since 1965 and currently account for 36.4% of all state spending (Schulman et al., 1997). The high cost of the program coupled with the increasing cost of medical care in general created a budgetary crisis for many states. As a result of the fiscal strains, many states decided to move their Medicaid recipients (sometimes voluntarily and other times by mandate) into newly created managed care plans with over 7 million joining the plans by 1994.

Studies have shown that Medicaid improves access to medical care, but has not been shown to reduce the incidence of poor birth outcomes (Dubay et al., 1995). Schlesinger and Kronebusch argue "...recent Medicaid expansions will not significantly reduce low birthweight and infant mortality, even after states fully implement these reforms. Medicaid eligibility increases prenatal visits, but Medicaid's beneficial effects are limited by the program's inability to encourage women to seek care earlier and its failure to induce better birth outcomes, once access has been established" (1990, p. 105). The Alpha Center (1995), a division of the Robert Wood Johnson Foundation, conducted an analysis of studies looking at the effect of the expansion of Medicaid. The research indicates that the expansions of Medicaid have led to greater enrollment of eligible women

earlier in their pregnancies, although there has been no marked decrease in poor birth outcomes overall.

In the early 1990s, in an effort to hold down medical costs associated with the program, the federal government and many states actively encouraged Medicaid beneficiaries to enroll in managed care plans (health maintenance organizations or HMOs). This was also encouraged because better health outcomes were hoped for by using the preventive philosophy of managed care plans. However, enrollment in managed care plans has had no effect on reducing poor birth outcomes (Schulman et al., 1997) even though, overall, similar care and resources are provided to women receiving perinatal care through Medicaid as those with private insurance (Dobie et al., 1998).

Interestingly, the expansion of Medicaid in Florida appears to have had a greater benefit for its Medicaid pregnant recipients. In particular, the low birthweight rate for white women enrolled in Medicaid due to the expansions declined from 67.9 to 61.8 per 1,000 live births, while the rates for low income, white women with private insurance remained the same (Long and Marquis, 1998).

Federal Healthy Start

During the Bush Administration's first couple of years in office, federal spending for primary care services, including the Maternal and Child Health Block Grant, increased by 51%, totaling more than $6 billion in federal fiscal budget year 1992. Of particular concern for the Bush Administration was the problem of infant morbidity and mortality. Bush set a goal for the U.S. to reduce overall infant mortality by 31%, to no more than 7 deaths per 1,000 live births, by the year 2000 (Cooper, 1992). Early in his administration, Bush appointed a commission to examine the problem and recommend solutions. The

task force's report was never released to the public, however, among the 18 recommendations developed by the task force was the expansion of Medicaid eligibility and the creation of national demonstration projects providing comprehensive maternal and infant services to reduce infant mortality. The program emphasizes community involvement reflecting the views of two members of the Bush administration, the assistant secretary for Health, James Mason, and Robert Harmon, Health Resources and Services Administration (HRSA) administrator (former public health directors for the states of Utah and Missouri, respectively) (Howell, et al., 1998).

Entitled "Healthy Start," Bush's program was enacted in 1991 and 15 communities were chosen for participation in the program. The program immediately created controversy within the states. The task force's recommendation would have cost over $500 million, but Bush was hesitant to increase federal spending to that level and recommended taking funds for the program from the Title V Maternity and Child Health Block Grants and the Migrant Health Programs. States saw the potential for significant funds to be taken away from their intervention programs to support a small number of demonstration projects. Maternal and child health advocates in the states argued that focusing that much effort on such a small number of areas would not significantly reduce the incidence of infant mortality. Rejecting the funding plan, Congress appropriated about half of the amount requested by the Administration for fiscal 1991 and 1992 for Healthy Start.

Administered by the HRSA of the U.S. Department of Health and Human Services (HHS), the federal Healthy Start program targets comprehensive perinatal services in those communities with the highest infant mortality rates in the United States. An internal

HHS work group outlined the community approach to delivering perinatal services in a document released to potential applicants in 1991 entitled, *Guidance for the Healthy Start Program*. Applications were due by July of 1991 for funding in September of 1991. The guidance emphasized "substantive and informed" consumer participation. This was to be accomplished by the creation of consortiums of community members who would be responsible for planning and the implementation of the program. This use of consortia and "community empowerment" has been considered by some analysts as "the feature of Healthy Start that most distinguishes it from previous maternal and child health programs" (Howell et al., 1998).

Eligibility for the program required that the project area have an average infant mortality rate for the five-year period between 1984-1988 of at least 150% of the national average. The area must also have at least 50 but no more than 200 infants deaths per year. Eligible applicants included: local or state health departments; publicly-supported providers; tribal organizations; private, nonprofit organizations; or a consortium of the above groups with the approval of the chief elected official of the city or county, or by tribal leaders. In the first year, the approved projects were expected to use the grant to develop a comprehensive plan for their community program. Forty proposals were submitted, and fifteen communities were eventually provided funding (Howell et al., 1998).

The fifteen communities originally selected for participation applied for a five-year period between 1992 and 1996. These communities and their relative infant mortality rates (infant deaths per 1,000 live births) in decreasing severity are as follow: Detroit, MI (26.3); New Orleans, LA (23.3); District of Columbia (23.2); Philadelphia, PA (22.3);

Cleveland, OH (21.3); Pittsburgh, PA (20.2); Baltimore, MD (20.1); Chicago, IL (19.6); New York, NY (19.4); northern Plains Indian communities in South Dakota, North Dakota, Iowa, and Nebraska (18.7); Birmingham, AL (18.4); Oakland, CA (17.9); Boston, MA (17.1); Lake County, IN (16.2); and Pee Dee region of eastern South Carolina (16.1). Each site received between 12 and 23 million dollars over this time period in order to meet an unprecedented goal of a reduction in infant mortality rates of 50% (Strobino et al., 1995; Howell et al., 1998). After the initial round of funding, other programs were added to the federal program until reaching the current number of 60 programs with an additional 14 planned (MCHB, 1998). Table 1 lists the current programs by state.

Table 1 -- Federal Healthy Start programs by state: 1998

STATE	COMMUNITY	NAME OF PROGRAM
Alabama	Mobile	TEEN Center
	Birmingham	Healthy Start
Arizona	Phoenix	Arizona Health Care Cost Containment System / Baby Arizona
Arkansas	Blytheville	Mississippi County Arkansas EOC, Inc.
California	Fresno	Healthy Start
	Los Angeles	SHIELDS for Families, Inc./ARK: Healthy Start Program
	Oakland	Oakland Healthy Start
	San Bernardino	San Bernardino County Healthy Start II Project
Colorado	Aurora	Metropolitan Denver Provider Network
Connecticut	New Haven	Healthy Start - New Haven
Delaware	Newark	Wilmington Healthy Start
District of Columbia	Washington, D.C.	District of Columbia Healthy Start

Table 1 -- continued.

Florida	St. Petersburg Tallahassee Tampa	St. Petersburg Healthy Start Federal Project Florida Panhandle Healthy Start Central Hillsborough County Healthy Start Project
Georgia	Augusta Dublin Savannah Stone Mountain	Augusta-Richmond County Healthy Start Heart of Georgia Healthy Start Chatham Savannah Healthy Start Center for Black Wellness, Inc.
Illinois	Chicago Southside Chicago Westside Chicago Park Forest East St. Louis	Chicago Healthy Start Healthy Start Southside Westside Healthy Start Aunt Martha's Healthy Start Program Southern Illinois Healthcare Foundation's East St. Louis Initiative
Indiana	Hammond Indianapolis	Northwest Indiana Healthy Start Indianapolis Healthy Start
Iowa	Des Moines	Healthy Start - Des Moines
Kansas	Wichita	Northeast Wichita Healthy Start Initiative
Kentucky	Louisville Williamsburg	Healthy Start Voices of Appalachia Healthy Start Project
Louisiana	Monroe New Orleans	North Louisiana Area Health Education Center New Orleans Healthy Start/Great Expectations
Maryland	Baltimore	Baltimore City Healthy Start
Massachusetts	Boston	Boston Healthy Start

Table 1 -- continued.

Michigan	Detroit Lansing Nazareth Sault Ste. Marie Saginaw	Detroit Healthy Start Michigan Departments of Community Health Bureau of Child and Family Services A Healthy Start in Kalamazoo "Maajtaag Mnobmaabzid" - A Start of a Healthy Life Saginaw Cooperative Hospital, Inc.
Mississippi	Jackson	Delta Futures: A Healthy Start Initiative
Missouri	Kansas City St. Louis	Kansas City Healthy Start Missouri Bootheel Healthy Start
Nebraska	Omaha	Omaha Healthy Start
New Jersey	Pennsauken Trenton	Camden Healthy Start Essex County Healthy Start
New York	Buffalo New York New York Rochester Syracuse	Buffalo Healthy Start Initiative - Phase II Downstate Healthy Families Connections Project Healthy Start / NYC Healthy Start Rochester Syracuse Healthy Start
North Carolina	Pembroke Raleigh	The University of North Carolina at Pembroke Healthy Start - Baby Love Plus
Ohio	Cleveland	Greater Cleveland Healthy Family / Healthy Start
Oklahoma	Oklahoma City Tulsa	Community Health Centers, Inc. Tulsa Healthy Start Initiative
Oregon	Portland White City	Healthy Birth Initiative Rogue Family Center Healthy Start

Table 1-- continued.

Pennsylvania	Chester Philadelphia Pittsburgh West Chester	Healthy Start, Chester Philadelphia Healthy Start Pittsburgh/Allegheny County Healthy Start Healthy Start Initiative for Chester County, PA
Puerto Rico	San Juan	Puerto Rico Healthy Start Project
South Carolina	Columbia Richland County Columbia Florence	Low County Healthy Start Richland Healthy Start Pee Dee Healthy Start
South Dakota	Aberdeen	Northern Plains Healthy Start
Texas	Dallas Fort Worth Galveston Houston	Dallas Healthy Start Catholic Charities, Diocese of Fort Worth Sisters of Charity Health Care System, Galveston Ministry Neighborhood Centers, Inc.
Virginia	Richmond	Virginia Healthy Start Initiative
Wisconsin	Lac de Flambeau Milwaukee	Honoring Our Children with a Healthy Start Milwaukee Healthy Beginnings Project

As part of the guidance provided to local communities, the federal government has recommended the use of one or more of nine models of intervention in their respective Healthy Start programs. These models reflect the strategies that seemed to work best in affecting poor birth outcomes in the initial demonstration project communities. These models include: community-based consortia; care coordination/case management; outreach and client recruitment; family resource centers; enhanced clinical services; risk

prevention and reduction; facilitating services; training and education; and adolescent programs (MCHB, 1998). Each of these models will be explained in greater detail below.

- **Community-based consortia:** As previously discussed, one of the basic tenants of the Healthy Start program is the involvement of persons in the community in the form of a consortium or coalition. These consortia are responsible for planning and implementing the program to meet the needs of their particular community. These consortia may be comprised of health care providers, consumers, advocates, business leaders, and/or government personnel. Federal Healthy Start programs utilizing this model include most of the initially funded programs.

- **Care coordination/case management:** This model emphasizes the total coordination of an individual patient's or family's health care services related to perinatal care and early childhood health. Usually a single provider is assigned to the patient who conducts a needs assessment, develops a care plan in cooperation with the individual, and ensure continuity of care within the health care system. Some of the federal programs most actively using this model include: Baltimore City Healthy Start; Boston Healthy Start; Chatham Savannah Healthy Start; District of Columbia Healthy Start; Florida Panhandle Healthy Start; Healthy Start/NYC; Northern Plains Healthy Start; Pittsburgh Healthy Start; and Richmond Healthy Start.

- **Outreach and client recruitment:** This model places emphasis on identifying at-risk populations and actively encouraging them to utilize the program's services. Some of the federal programs most actively using this model include: Baltimore City Healthy Start; Birmingham Healthy Start; Chatham Savannah Healthy Start; Cleveland Healthy Start; Dallas Healthy Start; Oakland Healthy Start; Pee Dee Healthy Start; Philadelphia Healthy Start; and Richmond Healthy Start.

- **Family resource centers:** Because transportation issues are usually one of the primary factors reported to decrease the utilization of these types of social services, this model attempts to increase the utilization of many of the program's services by increasing access through geographic placement of service centers. These "one-stop" centers, usually located in low-income areas, allow the patient and her family to access the Healthy Start services as well as other intervention programs such as WIC. Some of the federal programs most actively using this model include: Baltimore City Healthy Start; Chicago Healthy Start; Essex County Healthy Start; New Orleans Healthy Start/Great Expectations; and Oakland Healthy Start.

- **Enhanced clinical services:** This model emphasizes change to the existing health care delivery system. Again, trying to increase the utilization of these services, this model is based on improving the quality, availability, and user-friendliness of the perinatal and child health care system. Some strategies used in this model include: enhancing providers' cultural sensitivity; adding providers to the system; expanding health clinic hours of operation or introducing non-traditional hours (i.e., at night or

on weekends); and/or encouraging the role of the significant other in providing the infant or child care. Some of the federal programs most actively using this model include: Detroit Healthy Start and Oakland Healthy Start.

- **Risk prevention and reduction:** Contrary to what may expected by the name, this model emphasizes the need to address those nonmedical conditions which are believed to increase the risk of poor birth outcomes or slow early childhood development. This model usually involves providing services such as: smoking cessation programs; substance abuse treatment; mental health/psychological counseling; self-esteem enhancement; domestic violence prevention strategies; and education and employment training.

- **Facilitating services:** This model encourages the promotion of improvements to the infrastructure in a community with the goal of removing barriers to accessing care. This may include establishing transportation networks.

- **Training and education:** This model relates to the active recruitment and training of persons in the community interested in helping with the Healthy Start program. Using media sources and other community outreach efforts, the program hopes to bring new resources and skills into the program.

- **Adolescent programs:** The model emphasizes prevention activities in one of the most vulnerable populations: young adults and adolescents. Activities in this model may include sexuality education, substance abuse prevention, and life skills development to prevent births to teenagers.

The effects of the federal Healthy Start are still being evaluated. According to the administrating federal agency, HRSA, local sites have reported: "growing numbers of women entering prenatal care; reduced behavioral risk factors; location of multiple services at one central site, with improved access to and coordination of care; increased use of services by women and their families; improved family and community support for pregnant women and parents; increased public awareness of infant mortality and its contributing factors; broad-based partnerships with public and private sectors; positive economic impact on communities through employment and job training; [and] integrated state/local Title V and other maternal and child health services" (MCHB, 1998).

These anecdotal reports would seem to indicate a successful federal program aimed at reducing poor birth outcomes. However, in none of the literature examined is there any reference to meeting the Bush administration's original goal of reducing infant mortality by 50% in these communities by the end of the program funding period. In fact, as early as 1995, researchers were predicting that none of the federal Healthy Start programs would achieve the reduction in infant mortality hoped for at the outset of the program (Strobino et al., 1995). Most interestingly, evaluations of the federal program that have been conducted to date are not available for public review. Researchers from Mathematica Policy Research Inc. were commissioned to evaluate the impact of the program by the Clinton administration in the mid-1990s. Reports suggest that the analysis determined little or no impact by the federal Healthy Start program between 1992 and 1994. The research was scheduled to be presented at the November 1997 Annual Meeting of the American Public Health Association in Indianapolis. However, in the week prior to the meeting, Clinton administration officials "ordered" the researchers not to release the results of the evaluation, according to Joanne Pfeidere, spokeswoman for the Princeton, NJ-based firm (*Gainesville Sun*, 1997). Due to political pressures, an objective assessment of the program's outcomes may never be known.

Maternal and Infant Health Policy State Initiatives

Not to be left behind, the states have been active innovators of policies promoting maternal and infant health. In 1991, more than 350 new initiatives were introduced at the state level related to maternal and child health (Cooper, 1992). These programs range from the expansion of the Medicaid and other existing programs to truly unique intervention efforts. As a result, the states currently offer comprehensive maternal and

infant programs that rival the federal intervention programs. Table 2 describes the major components of the states' efforts. The data for the table were collected from secondary sources (Wiener and Engel, 1991; Wilen and Smith, 1996) and primary contacts by the author. Telephone communications with the directors of the various state health departments were conducted between April and June 1996 in order to evaluate the content of their maternal and infant care programs. Every state (with the exception of Hawaii and Alaska) and the District of Columbia were contacted for information. Ten states and the District of Columbia responded via postal mail with information concerning their programs, many including sample materials from their programs[4] (the District of Columbia is totally funded through the federal Healthy Start program, so will not be included in future discussion). The services provided in these programs usually include: 1) care coordination/case management; 2) risk assessment; 3) nutritional counseling; 4) health education (including smoking and substance abuse cessation classes); 5) psychosocial counseling; 6) home visitation; and 7) in some states, transportation for accessing these services (the "other" category may include resources such as incentive programs which seek to encourage the utilization of other services or infant formula).

Table 2 -- Maternal and infant care programs by state

State	**Care Coordination**	**Risk Assess.**	**Nutrition**	**Educ.**	**Psycho-Social**	**Home Visiting**	**Trans**	**Other**
AL	X	X		X	X	X		
AK	X	X	X	X		X		

[4] The ten states responding with additional information include: Alabama, Arkansas, Georgia, Indiana, Montana, Nebraska, Nevada, South Carolina, Tennessee, and Utah.

Table 2 -- continued.

AZ								
AR	X	X	X	X	X	X		X
CA	X	X	X	X	X	X		X
CO								
CT		X		X		X		
DE	X	X	X	X	X	X		
FL	X	X	X	X	X	X		X
GA	X	X		X		X		X
HI	X	X	X	X				X
ID	X	X	X		X	X		X
IL	X	X						X
IN				X				X
IA	X	X	X	X	X			
KS		X	X	X		X		
KY								
LA	X	X						X
ME								
MD	X	X	X	X	X	X		X
MA	X	X	X	X	X			
MI	X	X	X	X	X	X	X	
MN	X	X	X	X	X	X		
MS	X	X	X	X	X	X	X	X
MO	X	X	X					X
MT								X

Table 2 -- continued.

NE	X	X	X	X		X	X	X
NV	X	X	X	X	X	X		X
NH	X	X	X	X	X	X		
NJ	X	X	X	X	X	X		
NM	X							
NY	X	X	X	X	X	X		
NC	X	X		X		X		X
ND								
OH	X	X	X	X	X	X		X
OK								
OR	X	X	X	X		X		
PA	X	X	X	X	X	X		
RI								X
SC	X	X	X	X	X	X		X
SD								
TN	X	X	X			X		X
TX								X
UT	X	X	X	X	X	X		X
VT	X					X	X	
VA	X	X	X	X		X	X	
WA	X	X	X	X	X	X	X	X
WV	X	X	X	X				
WI								
WY								

Most of these programs are similar to the federal Healthy Start program, however, many started before the federal initiative. In fact, it could be argued that the federal government used the various components of state innovations in maternal and health benefits to create its program. And like the federal program, the effectiveness of the comprehensive state programs in achieving the stated goal of improving birth outcomes have never been objectively assessed or have been unable to show any benefit (Ross et al., 1994; Piper et al., 1996). The remainder of this study will attempt to establish any outcome in one state.

Intervention Programs to Reduce LBW Births in Florida: Florida Healthy Start

Florida Demographics

Florida's population is demographically heterogeneous. The state has a significant segment of its population under the poverty level, yet also several clusters of affluent communities. The economy is primarily based on tourism and service industries, although a significant technology and defense industry is present. Most races and ethnicities are represented in Florida in significant numbers and there are several predominately bilingual communities. The state has a large public university and community college system, although the educational attainment level varies from community to community. All of these factors combine to make Florida a difficult state in which to conduct widespread public health interventions.

Florida Maternal and Infant Health Indicators

Because of its heterogeneous demographics, certain health indicators are consistently worse for Florida than the rest of the United States. When examining these indicators, the unique demographics must be kept in perspective. This is especially true

for small area analyses where the population being assessed is so small that even a few poor healtb outcomes can make dramatic differences in three or even five year trends. This is why time-series analyses are so important. Looking at these factors on a longitudinal basis helps to create a more accurate image of what is actually occurring. This section is a longitudinal review of many of the outcomes related to maternal and infant health in Florida.

Florida consistently ranks low in most national rankings of socioeconomic and health measures, especially for children. Over 800,000 of Florida's children live at or below the national poverty level, placing it at 36 out of the 50 states in terms of impoverished children (1 being tbe least percentage of impoverished children and 50 having the highest). Thirty-one percent of its children are covered by Medicaid and almost 18% of tbem have no health insurance coverage, placing it at number 42 in national rankings. In 1995, Florida was ranked in the middle nationally (25) for infant deaths per 1,000 live births, but significantly lower in the percentage of infants born at a low birthweight (35 out of 50 nationally). What this means for the average child in Florida is that every 20 minutes an infant is born to a teenage mother, every 36 minutes a baby is born with low birthweight, and every 6 hours an infant under the age of one (Children's Defense Fund, 1998). Furthermore, it has been calculated that poor perinatal conditions in Florida account for 352 Years of Potential Years Lost (YPLL) per 100,000 population[5] (Office of Planning, Evaluation, and Data Analysis, 1996).

[5] Years of Potential Years Lost (YPLL) measures the impact of diseases and injuries that kill individuals before the age of 65. It is a sensitive measure of preventable death in childhood, youth, and adult productive years.

Figure 15 demonstrates that low birthweight birth rates for all races in Florida have fluctuated between 74 and 79 births per 1,000 live births over a ten-year period of time. What is significant is that the trend has been increasingly worse between 1991 and 1996. Although this reflects the national trend that is illustrated in Figure 14, it raises questions about the effectiveness of the Florida initiatives to reduce poor birth outcomes. According to the literature previously discussed, the low birthweight rates may be driven by the changing practice patterns of some physicians or an actual increase in poor birth outcomes. Additionally, the outcomes may be different when stratified by race.

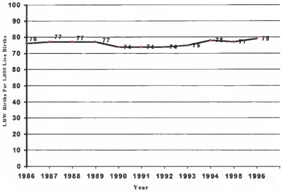

Figure 15 -- Low birthweight birth rates in Florida: 1986-1996

Although there has been an apparent increase in the low birthweight rates over the last few years, there has not been a corresponding increase in the rate of infant mortalities (Figure 16). Again, this is consistent with the national figures that show a significant decrease in infant mortality rates.

The medical literature suggest that this may be the result of changing practice patterns and the increasing use of technology which allows infants to be born at lower birthweights while ensuring higher infant survival. The downside of this indicator is that it raises further questions about the effectiveness of the Florida low birthweight intervention initiative. The next section will describe this program, Florida Healthy Start.

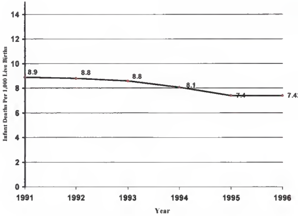

Figure 16 -- Infant mortality rates in Florida: 1991-1996

Florida's Approach to Maternal and Infant Health Programs

Florida's approach to maternal and child health interventions has been incremental in nature. New programs tend to be layered onto existing programs and the state usually increases its support only as federal involvement retreats. The most recent evolution of Florida's maternal and infant care program is the Florida Healthy Start program.

Healthy Start (Section 383, Florida Statutes) was signed into law June 4, 1991 and implemented initially through the local county public health unit beginning in 1992.

Proposed and advocated by the late Governor Lawton Chiles, Healthy Start was created to engage the community into addressing issues related to maternal and infant health. The idea was to create a program that would use "grassroots" advocacy to develop assessments of community need and health care system adequacy in order to determine how to ensure that women and infants could receive the necessary medical and psychosocial services necessary to reduce poor birth outcomes. Additionally, different than intervention programs in other states, Florida's Healthy Start program actually provides direct maternal and infant health care services. Specifically, Healthy Start was designed to address several goals including: 1) reduce the number of births to teen mothers from 71.1 per 1,000 to 50 per 1,000 adolescents by the year 2000; 2) reduce the total infant mortality rate from 10.1 per 1,000 live births to 7.0 live births by the year 2000; 3) reduce the infant mortality rate for non-whites from 17.9 per 1,000 live births to 11 per 1,000 live births by the year 2000; 4) reduce the percentage of low birthweight births from 7.6% to 5.0% by the year 2000; 5) reduce the percentage of non-white low birthweights births from 12.7% to 9% by the year 2000; 6) reduce the percentage of very low birthweight births to no more than 1% by the year 2000; 7) reduce the percentage of non-white very low birthweights births from 2.7% to 2% by the year 2000; and 8) increase the percentage of pregnant women entering the prenatal care system in their first trimester from 65% to 90% by the year 2000. In order to accomplish these goals, the program takes a holistic, community-based approach that seeks to address the environmental, social, economic, and behavioral factors that affect pregnancy and infant development. In order understand how this program is constructed it is necessary to

examine each of three component: the coalition; the screening tool; and the health care and support services.

Healthy Start Coalitions

As earlier stated, the state envisioned a community-based approach to providing maternal and infant health care. In order to accomplish this goal, the state's counties were divided into thirty-three "coalitions" based on their congruent health care systems (see Table 3) (Florida Department of Health and Human Resources, 1995).

Table 3 -- Florida Healthy Start coalitions and their respective counties

Coalition Name	**Coalition Counties**
Healthy Start of North Central Florida (recognized by the state in April 1992)	Alachua, Bradford, Columbia, Dixie, Gilchrist, Hamilton, Lafayette, Levy, Marion, Putnam, Suwannee, Union
Northeast Florida Healthy Start Coalition (recognized by the state in December 1992)	Baker, Clay, Duval, Nassau, St. Johns
Bay, Franklin, Gulf Healthy Start Coalition (recognized by the state in December 1992)	Bay, Franklin, Gulf
Prenatal and Infant Health Care Coalition of Brevard County (recognized by the state in December 1992)	Brevard
Broward Healthy Start Coalition (recognized by the state in December 1992)	Broward
Capital Area Healthy Start Association (recognized by the state in December 1992)	Calhoun, Leon, Liberty, Wakulla
Healthy Start Coalition of Southwest Florida	Collier, Glades, Hendry, Lee
Central Healthy Start (recognized by the state April 1992)	Citrus, Hernando, Lake, Sumter
Dade Healthy Start	Dade
Escambia County Healthy Start Coalition (recognized by the state in December 1992)	Escambia
Healthy Start Prenatal and Infant Care Coalition of Flagler and Volusia Counties (recognized by the state in February 1993)	Flagler, Volusia
Gadsden Citizens for Healthy Babies (recognized by the state in December 1992)	Gadsden

Table 3 -- continued.

Healthy Start Coalition of Hard, Highlands, Polk Counties (recognized by the state in January 1993)	Hard, Highlands, Polk
Healthy Start Coalition of Hillsborough (recognized by the state in April 1992)	Hillsborough
Healthy Start Coalition Three (recognized by the state in February 1993)	Holmes, Jackson, Washington
Indian River County Healthy Start Coalition (recognized by the state in January 1993)	Indian River
Healthy Start Coalition of Jefferson, Madison, and Taylor Counties (recognized by the state in December 1992)	Jefferson, Madison, Taylor
Healthy Start Coalition of Manatee County (recognized by the state in January 1993)	Manatee
Martin County Healthy Start Coalition (recognized by the state in February 1993)	Martin
Florida Keys Healthy Start Coalition (recognized by the state in December 1992)	Monroe
Healthy Start Community Coalition of Okaloosa and Walton Counties (recognized by the state in December 1992)	Okaloosa, Walton
Okeechobee County Family Health/Healthy Start Coalition (recognized by the state in July 1993)	Okeechobee
Orange County Healthy Start Coalition (recognized by the state in December 1992)	Orange
Healthy Start Coalition of Osceola (recognized by the state in July 1993)	Osceola
Healthy Start Prenatal and Infant Health Care Coalition of Palm Beach County (recognized by the state in December 1992)	Palm Beach
Healthy Start Coalition of Pasco County (recognized by the state in December 1992)	Pasco
Healthy Start of Pinellas County (recognized by the state in April 1992)	Pinellas
Healthy Start Coalition of Santa Rosa (recognized by the state in April 1992)	Santa Rosa
Seminole County Healthy Start Coalition (recognized by the state in February 1993)	Seminole

Table 3 - continued.

Healthy Start Coalition of St. Lucie County (recognized by the state in July 1993)	St. Lucie
Charlotte County Healthy Start	Charlotte
Despot County Healthy Start	Despot
Sarasota County Healthy Start	Sarasota

These coalitions consist of representatives of private medical providers, medical societies; public health units, health maintenance organizations (HMOs), educators, advocates, consumers, and other interested parties. Each coalition joined the program at different times between 1991 and 1994, but all counties in Florida are covered at this time. In the interim period between the approval of the legislation and the creation of a coalition, the county public health units (CPHU) were responsible for service delivery and program planning. Once the coalitions were created, they became responsible for the development of a service plan using community assessments to identify the local need for comprehensive preventive and primary prenatal and infant health care including: determining priority target groups; determining outcome performance objectives; identifying local providers of services; coordinating service providers to ensure access to care; evaluating and adjusting the community service delivery system to meet unmet needs; and build broad-based community support. Coalitions have complete control over the distribution of its funds and may hire staff to help in the administration of the program. Over time, the coalitions acquired additional responsibilities including conducting fetal and infant mortality reviews (comprehensive statistical and epidemiological assessments of infant and fetal deaths that include medical record reviews and parental interviews). If a

county elects not to participate, then the local Department of Health is responsible for conducting the activities required by state statute.

Among their primary responsibilities, the Healthy Start coalitions are responsible for allocating public funds associated with maternal and infant health care including Improved Pregnancy Outcome (IPO) and Healthy Start Service funds provided through state general revenue funds. The coalitions are also responsible for the allocation of certain federal Maternal and Child Health Block Grants and Medicaid dollars. There are also in-kind contributions provided by community organizations.

Healthy Start Screening Tool

Another significant component of the Florida Healthy Start program is the use of an universal screening instrument. This tool is used to assess medical, social, and economic risk factors present during the perinatal period. The universal nature of the tool is fairly unique among the state interventions programs previously discussed. Under state law, all women and infants are to be offered screening, irrespective of income, social status, or location of services. Specifically, the screening, identification, and interventions are required to begin "prior to and immediately following the birth of the child by the attending health care provider…[and] such efforts shall be conducted in hospitals, perinatal centers, county health departments, school health programs that provide prenatal care, and birthing centers, and reported to the Office of Vital Statistics" [Section 383.14 (1), F.S.].

The prenatal screening is a high risk assessment used to identify women at risk for preterm birth, low birthweight birth, postneonatal mortality, or other high-risk conditions based on much of the medical literature previously described in this analysis. The

screening tool is optimally offered at the first encounter with a health care provider (usually when the pregnancy is identified or confirmed) although there is a benefit in the assessment being conducted at any point of the pregnancy. The screening tool uses a weighted scoring system to assess the relative risk for the pregnant woman. Although the points scored for some of the risk factors changed slightly in October 1994, the assessment still uses a score of "4" as a threshold for intervention. If a woman scores "4" or more on the screening tool, she is eligible for and offered Healthy Start services. Additionally, referrals are accepted for reasons other than score (i.e., chronic drug-use may prompt a referral even though the person may not have other risk factors, unlikely but possible). The factors that are used for scoring and their respective score value are as follow (Freeman, 1997):

- the woman's age is less than 18 or greater than 39 (1 risk point);
- the woman is black (2 risk points);
- the woman is unmarried (1 risk point);
- the woman has not graduated from high school or has a GED (1 risk point);
- the woman weighted less than 110 lbs. prior to the pregnancy (1 risk point);
- the woman has problems preventing her from keeping appointments (1 risk point);
- the woman has moved more than three times in the last 12 months (1 risk point);
- the woman feels unsafe where she lives (1 risk point);
- the woman or any member of her household goes to bed hungry (1 risk point);
- the woman has used tobacco in the last two months (1 risk point);
- the woman has used alcohol or other illicit drugs in the last two months (1 risk point);
- the woman does not want to be pregnant (1 risk point);
- the woman's last pregnancy had a poor outcome (1 risk point);
- the woman has a chronic illness requiring continuing medical care (1 risk point); or,
- the woman entered prenatal care in the second trimester (1 risk point).

The prenatal screening process works in the following manner. A woman's pregnancy is confirmed by a medical provider in Florida. She is offered a Healthy Start screen, which is voluntary, so she may accept or decline. If she declines the screen, a

indication of refusal is placed on the screening form that is sent to the state Office of Vital Statistics for tracking. If she accepts screening, the various risk factors are assessed and a total score is calculated. If she scores a "4" or more (or there is some condition present that warrants intervention irrespective of score), she is offered Healthy Start services. Again, because the program is voluntary, she may accept or decline. If she declines, an indication of refusal is placed on the form and it is sent to the state Office of Vital Statistics. If she accepts services, her screening form with the risk factors is sent to the county public health unit for tracking purposes. The screen is then sent to the Healthy

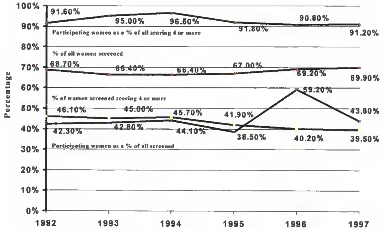

Figure 17 -- Healthy Start prenatal screening rates: 1992-1997

Start Care Coordination Provider in the coalition in which the resides, who assigns a care coordinator for the individual. Services are then provided. Figure 17 illustrates the percentage of pregnant women consenting to be screened, the percentage of those

consenting who score a "4" or more, the percentage of those screening with a "4" or more who agree to participate in Healthy Start, and the percentage of pregnant women screened who ultimately participated in the program between April 1992 and September 1997.

As previously discussed, Florida law also requires that each infant be offered a Healthy Start screening immediately after birth, even if the mother declined a prenatal screening or was already a Healthy Start service recipient. A score of "4" or more indicates that the infant is at risk for postneonatal mortality. The following risk factors and their respective scores are as follow:

- the mother's age is less than 18 or unknown (1 risk point);
- the mother's race is other than white or unknown (1 risk point);
- the mother's education is less than 12th grade or unknown and the woman is more than 18 years of age (2 risk points);
- the mother is unmarried (1 risk point);
- there was no prenatal care, it began in the ninth month, or is unknown (4 risk points);
- the infant's birthweight is less than 2000 grams or 4 lbs., 7 oz. (4 risk points);
- the mother used tobacco during the pregnancy and the number of cigarettes per day is more than nine or unknown (1 risk point);
- the mother used alcohol during pregnancy or if alcohol use is unknown (1 risk point);
- abnormal conditions of the newborn include fetal alcohol syndrome, or hyaline membrane disease/RDS, or assisted ventilation for 30 minutes or more (4 risk points); or,
- the infant has one or more congenital anomalies (4 risk points).

The infant (postnatal) screening process works in the same basic manner as the prenatal screening process (see Figure 18). The most significant exception is that an infant screening with certain medical or developmental problems immediately apparent will be referred through the Children's Medical Services Early Intervention Program (EIP), now established in most hospitals providing Level II and III newborn intensive care services (Florida Department of Health, 1998).

Healthy Start Health Care and Support Services

At the core of the Healthy Start program is the direct provision of health care and support services. This is different than many of the maternal and infant health programs in other states where care coordination and education were the main focus. In Florida, coalitions contract with private and public health providers to give direct services to Healthy Start participants, services equivalent to those received in the private health system. The provision of these services are based on the goal of providing optimal perinatal care including preconceptional counseling, the use of birth control methods to

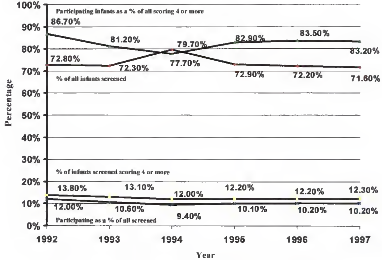

Figure 18 -- Healthy Start infant (postnatal) screening rates: 1992-1997

space births, prenatal care, labor and delivery services, postnatal and newborn care, and primary health care. In addition to these medical services, Healthy Start program services

include: 1) care coordination; 2) outreach and case finding; 3) information and referral; 4) comprehensive assessment of service needs; 5) ongoing care coordination and support to assure access to needed services; 6) family support planning; 7) psychosocial counseling; 8) nutritional counseling; 9) smoking, alcohol, and drug cessation counseling; 10) childbirth support and education; 11) parenting support and education; 12) breastfeeding support; and 13) home visiting. Which particular services are provided to any particular Healthy Start participant is dependent on the care coordination plan developed upon the entry into the program.

Evaluations of Florida's Healthy Start Program

Florida's Healthy Start program has undergone some evaluations, although much of the research is subjective, not statistically valid, descriptive, or only examines one particular component of the program. For example, after only a couple of years, there were claims that Healthy Start was making an immediate impact on health outcomes. According to representatives of Florida's Department of Health and Rehabilitative Services (HRS), an estimated 192 infants survived in 1993 that otherwise might not have if not for Healthy Start interventions (comments made by Secretary James Towey at the Sharing Solutions Conference, Orlando 1994)[6]. This section will examine some of these analyses.

As recent as 1998, descriptive analyses were being reported to suggest that Healthy Start has made a significant impact in poor birth outcomes. According to the

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[6] Confidential discussions with the individual who conducted the analysis from which Secretary Towey based his comments stated that the data could not be construed to argue that Healthy Start has made such an impact. The person stated that the Secretary knowingly used the information out of context. (Source: Personal communication with the author in November 1994.)

Florida Department of Health (1998), since the beginning of Healthy Start the following results have been achieved:

- the percentage of women getting first trimester prenatal care has risen from 74% in 1991 to more than 82% in 1996;
- the percentage of women getting late or no prenatal care has decreased from almost 6% to just over 3%;
- the percentage of two-year-olds completing their immunizations has risen from 63% to 82%;
- the percentage of high-risk infants who have begun to receive their shots by the age of seven months has risen from 78% to 93%;
- neonatality rates have fallen from 5.6 per 1,000 live births to 4.7 per 1,000 live births; and,
- total infant mortality rates have declined from 8.0 per 1,000 live births to 7.5 per 1,000 live births since Healthy Start began.

Contrary to the Department's assertions, these descriptive statistics can not be inferred to show causality. The decline in these figures may be explained by any number of factors.

Other Healthy Start analyses are more useful for understanding the program's impact. Simmons (1995) looked at the impact of one component of the Healthy Start program, smoking cessation classes. Using Healthy Start service data from 1993, the participants were divided into two groups, smokers and nonsmokers. For purposes of the study, smokers were identified as those reporting they smoked more than ten cigarettes a day on the Healthy Start screen. Low birthweight rates were compared between the groups and significantly higher rates were found in the smoking population. One of the services provided in Healthy Start is smoking cessation counseling. The second section of the study examined the impact of the smoking cessation classes on low birthweight rates. The Healthy Start participants who smoked were divided into those who accessed the smoking cessation services and those who did not participate in these services. The author found a significant decrease in low birthweight birth rates for those women who

participated in the classes, which was even more significant for black women in the study group.

Central Hypothesis

Although these analyses are interesting, they do not provide evidence to show that the Florida Healthy Start program has made any impact on the target population as a whole. This being the case, the question becomes whether we should expect any impact. The Healthy Start program is based on the premise that certain interventions (medical or psychosocial) can reduce the risk of poor birth outcomes. The review of the medical literature conducted earlier suggest that it is unlikely that these interventions will have any impact or that the screening process will identify the women who will actually have a poor birth outcome. In addition, assessments of similar programs have failed to show that community interventions have any impact on outcomes. Finally, the literature suggest that even if the factors which affect successful policy implementation are present, it may be difficult to link the program's outputs to a direct impact on its outcome goals.

This study will build on the current medical and implementation literature by assessing whether Florida's Healthy Start program has met its program goals of reducing poor birth outcomes in high-risk women. The central hypothesis being tested in this study is as follow:

H_o: The Florida Healthy Start program has reduced the rate of low birthweight births within the target population in Florida since its implementation in 1992.

H_a: The Florida Healthy Start program has not reduced the rate of low birthweight births within the target population in Florida since its implementation in 1992.

An analysis of the Healthy Start program presents an interesting opportunity to test this hypothesis because of the unique nature of this policy. First, there is the potential to see significant changes in outcomes fairly quickly. Unlike a health policy that seeks to address cancer risks or other diseases that take years to develop, this health policy has the potential to produce changes within a minimum of nine months. This policy is an ideal policy to examine for other reasons as well. For example, the policy is recent and most of the original actors that have been involved at the various levels of government are still active in the policy's implementation. Second, the main objectives are to reduce low birthweight births and infant mortality, two measures that have been recorded for several decades and that have the potential to be affected almost instantaneously. Unlike other health conditions, birth outcomes can be directly attributed to both short-term and long-term behaviors and changes in these outcomes can appear within a single nine-month period of time. Finally, this policy lends itself to examining linkages between policy outputs and policy outcomes. The next section will explain the methodology for examining the impact of Florida's Healthy Start program on poor birth outcomes in the state.

CHAPTER 3
METHODS AND RESULTS: STATE LEVEL ANALYSIS

The purpose of the analysis in this chapter is to determine whether there has been a change in the low birthweight rates in Florida since the inception of the Health Start program in 1992. This chapter is divided into several sections. First, the main hypothesis will be discussed. Then a comparison of regression analysis and ARIMA time-series analysis is conducted in order to explain why the Box-Jenkins methodology was selected as the tool for this analysis. Next, the dependent variable and the analytical procedure is described. Finally, the results of the ARIMA analysis are described.

Hypothesis

This study will build on the current medical and implementation literature by assessing whether Florida's Healthy Start program has met its program goals of reducing poor birth outcomes in high-risk women. The central hypothesis being tested in this study is as follow:

> ***H_o: The Florida Healthy Start program has reduced the rate of low birthweight births within the target population in Florida since its implementation in 1992.***
>
> ***H_a: The Florida Healthy Start program has not reduced the rate of low birthweight births within the target population in Florida since its implementation in 1992.***

Quasi-experimental Time-Series Analysis: Linear Regression and ARIMA

Donald Campbell (1963) first proposed the use of time-series quasi-experiments "as a means of assessing the impact of a discrete intervention on a social policy process"

(McDowall, et al., 1980, p. 10). This form of experimentation uses a measurement of the dependent variable before and after a discrete intervention to establish a trend in the data and then observe if there is a change in the trend following the intervention. The standard modeling of this quasi-experiment as is follows (Cook and Campbell, 1979):

$$\mathbf{O_1 \quad O_2 \quad O_3 \quad O_4 \quad O_5 \quad \mathit{X} \quad O_6 \quad O_7 \quad O_8 \quad O_9 \quad O_{10}}$$

In this model, the O_n is the measurement of the dependent variable at a constant interval of time (i.e., yearly, monthly, daily) and the X indicates when in the time series that the intervention took place. Statistically the quasi-experimental time-series can be modeled as the following (McDowall, et al., 1980):

$$\mathbf{Y_t = b_{pre} + b_{post} + e_t}$$

where

$\mathbf{Y_t}$	=	the t^{th} observation of a time series
$\mathbf{b_{pre}}$	=	the pre-intervention series level
$\mathbf{b_{post}}$	=	the post-intervention series level
$\mathbf{e_t}$	=	an error term associated with Y_t.

In theory, any change in the trend should be attributable to the intervention and so some causality can be assumed. For this reason, the null hypothesis in most time-series analyses is: did the intervention have an impact on the time series? This null hypothesis can be modeled as follows (McDowall, et al., 1980):

$$\mathbf{H_o:\ b_{pre} - b_{post} = 0}$$

This model "states that there is no statistically significant difference between the pre and post-intervention series levels, that the intervention had no statistically significant impact on the series level" (1980, p. 12).

In this process, there are a number of assumptions and threats to the validity of the study (Johnson and Joslyn, 1986). The first significant assumption is that any change was not the result of some other intervention that occurred at the same time. This will be very important to consider when examining the Florida Healthy Start program because another maternal and infant health care program underwent changes at approximately the same time (Medicaid allowed an expansion of eligibility for pregnant woman in the same year that Healthy Start was implemented). Another assumption is that the trend would have continued "undisturbed" if not for the intervention.

In addition to these assumptions, this form of experimentation is problematic for threats to internal validity. Threats to internal validity include: maturation, testing, instrumentation, regression, selection, mortality, and the interaction of two or more of these factors (e.g., selection and maturation) (Bingham and Feldbinger, 1989). *Maturation* involves changes produced in the subject as a function of the passage of time. This is a greater threat when the researcher is using the same subjects over time. Children who are subjects in time series research are particularly good examples. As children grow older, they develop certain cognitive and social skills that may impact the way they approach the study requirements. Another threat to internal validity is *testing*. This is the effect of taking the test at one point of time and taking it again after some intervention. Subjects may recall their initial responses are may have developed a better understanding of the issue being examined because they were tested initially, both of which may result in different results then might have occurred if the subject had only received a single test. Again, this is primarily a problem when using the same subjects in the pre and post-intervention testing. The third validity threat is *instrumentation* or *instrumentation decay*.

Any changes to the testing instrument during the pre and post-intervention period may result in biases in the study. For example, an opinion survey which uses slightly different wording in its questions or the questions are in a different order may result in completely different answers then those the researchers may have found if the survey remained the same. This threat to internal validity is a concern whether or not the subjects are the same during the pre and post-intervention period. *Regression* is the phenomena of subjects scoring at an extreme in any study later graduating toward the average score for themselves or the group as a whole. For example, some children tested for intelligence levels may score significantly above the average for others in their same age group. While this may be a true indication of higher measured intelligence, it may also be the result of unusually good guessing on some measurements. Repeated measurement would allow the individual to move toward the average for the group if his/her intelligence levels is actually the same. If the average scores or consistently higher, then the average of those personal scores is a better indication of the subject's true measured intelligence. The fifth threat is *selection* or the possibility that some study participants are more likely to participate than others. The basic problem is that it is likely that the participants are different than those who would not participate. If selection bias is present, it is difficult to generalize any identified impact to persons outside of the study group. The final threat to internal validity is *mortality*. Mortality is just as it sounds, the removal of a subject from the study group. This make occur for a number of reasons and may be initiated by the subject or by the researcher. If mortality reaches a significant level, the validity of the study may be compromised because the population may become too small. In addition to these independent threats to validity, additional complications may rise if the synergistic

effects of two or more of the above discussed threats to validity are present at the same time. Independently, the two factors may not have an impact although the two combined create an *interaction* effect that becomes as considerable threat to internal validity as any single factor.

There are a number of ways to statistically analyze interrupted time-series information although the goal is the same for each, determine if the intervention (the implementation of the policy program) results in a change in the targeted outcome (low birthweight birth rates). Statistically, the researcher is looking for an "interruption" in the trend that coincides with the intervention. The researcher compares the previous trend with the post-intervention trend in tries to identify a "transfer function," that is, a change in the slope or the intercept in the pre and post trend period. Two comparable techniques for analyzing these data are linear regression and an autoregressive-integrated-moving average (ARIMA) procedure. Each has certain strengths depending on the statistical needs of the researcher.

Linear Regression

When the quasi-experimental design first entered the literature, the validity of the statistical conclusions became immediately under fire (McDowall, et al., 1980). Most researchers initially used ordinary least squares (OLS) regression to examine the pre and post-intervention trends (the linear regression approach is still the technique which is most familiar to social scientists). Usually this is conducted by regressing the dependent variable on a constant, a linear trend term, and a "dummy" variable which would indicate the intervention period by placing zeros in the pre-intervention period and ones in the post-intervention period (Joyce, 1990). Additionally, the model includes an interaction

variable that is the product of the linear trend term and the dummy variable. A positive or negative coefficient in the trend term and the inverse coefficient on the interaction would indicate a change in the trend after the intervention. In general, a simple time series regression can be modeled statistically as follows (Ostrom, 1978):

$$\mathbf{Y_t = a + bX_t} + e_t$$

where

$\mathbf{Y_t}$	=	change in the endogenous variable across time
$\mathbf{a}$	=	unknown parameter (to be determined by the analysis)
$\mathbf{bX_t}$	=	unknown parameter of the exogenous variable across time
e_t	=	the random disturbance term across time.

Another aspect of time-series regression is how the endogenous and exogenous variables interact with each other across time. In a standard linear regression model the endogenous variable's values are determined by the model and the exogenous variables' values are determined by factors outside of the model at the same point of time. In time series regression, the model may be either lagged or non-lagged. A lagged model assumes that one measurement value of the endogenous variable is impacted by previous values of the exogenous variable or of the endogenous variable itself. A non-lagged model assumes that the endogenous and exogenous variables, which are measured at the same time, are not impacted by previous values of the variables. These models are statistically based on the following assumptions (Ostrom, 1978):

1. Linearity, that is, the relationship between the endogenous and exogenous variables is linear;
2. Nonstochastic X (exogenous variable): $E[e_tX_t] = 0$
3. Zero Mean: $E[e_t] = 0$
4. Constant Variance: $E[e_t^2] = \sigma_e^2$
5. Nonautoregression: $E[e_te_{t-m}] = 0 \quad (m \neq 0)$

This last assumption is the one that creates the greatest problem for using regression with time series data. Because OLS estimates assume that an error term is uncorrelated with any previous error terms, the standard errors of OLS parameter estimates of time series data are biased, resulting in variance estimates which are understated and seriously overstated statistical significance of the intervention's impact (Cook and Campbell, 1979; McDowall, et al., 1980). These error terms appear as "white noise" which may cover up the true effect. There are ways in which this problem can be corrected statistically which will be discussed next.

Autoregressive-Integrated-Moving Average (ARIMA)

The "noise" in time series data usually takes one of three forms: trend, seasonality, and random error. *Trend* is the up and downward drift which underlies time series data. *Seasonality* describes how the data may "spike" at regular intervals over time. *Random error* is the random fluctuation of the data around some level after the trend and any seasonality are controlled for statistically (McDowall et al., 1980). One of the best methods for controlling for this noise is the autoregressive-integrated-moving-average (ARIMA) models developed by Box and Jenkins (Hoff, 1983). These models allow the researcher to produce "unbiased" estimates of the error terms by controlling the error terms' correlation over time. "As a result, only the white noise remains, and the transfer function can be accurately estimated" (Bingham and Felbinger, 1989).

Cook and Campbell (1979) describe the two main components of any time series analysis: the deterministic and the stochastic. The *deterministic* component describes the systematic behavior of the time series data. All parameters of the time series that are not dependent on the error structure are represented in the deterministic component. The

second component is the *stochastic* (or "noise" component). This component describes the nature of the unobserved error within the time series. This component has two parts: the systematic and the unsystematic. The systematic aspect of the stochastic component is the part that is responsible for the autocorrelation in the data and is the primary target of the analysis using an ARIMA process. Once the structure of the autocorrelation is identified, it can be reincorporated into the overall model. With the systematic aspect accounted for in the model, there is only the unsystematic aspect remaining, which allows for unbiased estimates. Once the noise is controlled for, an assessment of the impact of the intervention may be conducted.

ARIMA models describe time series data as the *realization* of a stochastic or "noise" process which generated the time series (Cook and Campbell, 1979; McDowall, et al., 1980). An ARIMA model is composed of three structural components or parameters, p, d, and q, which explain the relationship between "random shocks" and the time series [the description of which is designated as ARIMA (p,d,q)].

The structural parameter p represents the autoregressive relationship of the data, that is, the number of past observations used to predict the current observation. When there is a direct relationship between the adjacent observation in a time series the value of p exceeds zero. We examine the value of p to determine the extent to which the previous observations in the series allow us to predict the current value of the observation in the series. Statistically, a time series data set in which one previous observation is used to

predict the current observation is said to have a single autoregressive term [i.e., $p = 1$ or ARIMA (1,0,0)]. This single autoregressive term can be represented statistically as:

$$\mathbf{Yt} = \Phi_1 \mathbf{Y}_{t-1} + \mathbf{a}_t$$

where

Φ_1	=	the correlation coefficient describing the magnitude of the dependency between adjacent time-series observation ($\mathbf{Y}_{t-1}$),
$\mathbf{a}_t$	=	the unsystematic residual or error term of the prediction which is considered the remaining "noise" or "random shock."

The higher the value of Φ_1, the greater the dependency of the current observation on the previous. Additionally if Φ_1 is positive, large values in the series will follow large values and small values will follow small values; and if it is negative, large values will follow small values and vice versa. Finally, the current observation may be dependent on more than one autregressive term ($p > 1$), although it is rare to have a model with more than three autoregressive terms. For those models with an additional term we must add another correlation coefficient as follows:

$$\mathbf{Yt} = \Phi_1 \mathbf{Y}_{t-1} + \Phi_2 \mathbf{Y}_{t-2} + \mathbf{a}_t$$

The second structural parameter, *d,* in the ARIMA model is related to the concepts of *stationarity* and *differencing*. ARIMA models may only be used if the time-series data is stationary, that is, "there is no systematic increase or decrease in the level of the series as it drifts upwards or downwards" (Cook and Campbell, 1979). The problem is that most time series datasets analyzed in the social sciences are not stationary. Fortunately,

ARIMA allows the researcher to statistically adjust the data to make it stationary, this is the process of differencing. Simply put, differencing is the process of subtracting the first observation in a series from the second, the second observation from the third, and so on. When a nonstationary dataset is corrected in this manner it is said to *nonstationary in the homogeneous sense* (Cook and Campbell, 1979). This process only affects the manner in which the parameters are represented in the model, no deterministic parameters are changed. The structural parameter *d* indicates the number of times the series has to be differenced before it becomes stationary. In the ARIMA model description, the differencing parameter where the data has been differenced once is represented as ARIMA (0,1,0). Statistically, this model is represented as the following:

$$\mathbf{Y_t - Y_{t-1} = a_t}$$

$$\mathbf{Y_t = Y_{t-1} + a_t}$$

It is unlikely that a time series must be differenced two or more times. Once the data is stationary, we give the trend a different representation in the model. If the data is differenced, we must then add another parameter to the time series model - a constant. This constant is usually represented by θ_0 that is interpreted as the slope of the series.

The third structural parameter is the moving average order of the an ARIMA model, or the *q*. Some time series have a persistent random shock from one observation to the next, so the moving average parameter helps to predict the value of the next observation. The moving average parameter may be statistically modeled as the following:

$$\mathbf{Y_t = a_t - \theta_1 a_{t-1}}$$

And as in the case of other structural parameters, the moving average order may be higher than one [ARIMA (0,0,2)],in which case the data are modeled statistically as follows:

$$Y_t = a_t - \theta_1 a_{t-1} - \theta_2 a_{t-2}$$

This can be interpreted to mean that the current observation may be predicted by the preceding random shocks associated with the previous two observations.

When looking at the model as a whole, the researcher may see the observations in a time series as the result of the data moving through a number of "filters," the structural parameters. In order for the researcher to generate a valid ARIMA model, he/she must use a three-step procedure: 1) identification, 2) estimation, and 3) diagnosis. As stated earlier, the purpose of the ARIMA model is to *identify* the systematic part of the stochastic component of the time series. This identification involves observing the attributes of the autocorrelation function (ACF) and the partial autocorrelation function (PACF). Once a possible model has been identified, the model parameters (values of Φ and θ) are *estimated.* The ACF and PACF for the residuals of this model are used to *diagnose* the adequacy of the model. This procedure is repeated until a satisfactory model is developed. This is similar to the linear regression process in which exogenous variables that are highly correlated or have no explanatory power are removed from the model. Once the model has described the systematic "noise" the researcher must add the intervention component to the model. To the extent that the intervention component increases the model's predictability, the component will be statistically significant. This is the actual hypothesis testing. "Thus, the crucial issue is to establish whether the intervention adds significantly to predicting the behavior of a time series over and above the prediction that is offered through an understanding of the regular and seasonal components of the noise" (1979, 262).

Dependent Variable

For purposes of this study, the dependent variable to be analyzed in the monthly low birthweight rate for nonwhite births in Florida between January 1988 and December 1996. There are several reasons why the rates for nonwhite low birthweight births are being analyzed, rather than the rates for all births or white births exclusively. First, as previously discussed in this research, rates of low birthweight births and infant mortalities are significantly higher for nonwhites than whites (often more than twice as likely). This has created an urgency within the medical and public health literature to determine how to address this problem in the nonwhite population. In fact, the Healthy Start screening tool is biased towards trying to bring nonwhites into the program because of the recognized risks associated with this population. Another reason for the focus on the nonwhite population is that these individuals represent the majority of the program's participants. Focusing exclusively on this population provides the best opportunity to determine if the program has had an impact on poor birth outcome rates. The failure of policy researchers to analyze the subpopulations within a program may be one of the reasons the implementation has been unable to conclusively link a program's outputs with a change in the outcomes. This study proposes that one of the reasons that the policy implementation literature so often fails to link outputs to outcomes is that there can be an outcome hidden within another outcome. For example, Durant and Legge (1992) looked at national traffic fatalities to see what affect minimum legal drinking age laws would have on these fatalities. While the authors found a significant initial decrease in the overall traffic fatalities, the true affect was thought to be on the youngest drivers. But this affect was hidden in the larger outcome because young drunks do not just kill themselves, but people

of all ages. In the Healthy Start program, the precise effect may be that the policy affects the low birthweight and infant mortality rate of minorities more than non-minorities, however, because whites significantly outnumber minorities overall within the state, the policy effect may become hidden when the statewide rates are examined.

Procedure

Raw data were obtained from birth records of all live births in Florida, tabulated by the Florida Office of Vital Statistics, and distributed by the College of Public Health at the University of South Florida. These raw data (total live births, total low birthweight births, total number of births to women 17 years of age or younger, and total births which began prenatal care in the first trimester) were provided for each county in the state of Florida by race and month from 1988 through 1996. Rates were calculated by examining the proportion of low birthweight births to total live births and then multiplied by 1,000 in order to standardize the rates. It is standard to report these rates on a per 1,000 live birth proportion. These rates are standards that are reported within the medical and public health community, both nationally and internationally. The low birthweight rates for nonwhite women were analyzed by using the ARIMA procedure previously discussed. The ARIMA models were calculated using the PROC ARIMA procedure in Statistical Application Software (SAS). For purposes of this study, the intervention date for the Healthy Start program was set in April 1992, the fifty-second observation of the time series. This is the date that many of the local coalitions were recognized by state officials and funds began being distributed throughout the state.

Results

This section will examine the results of the ARIMA analysis of the impact of the Florida Healthy Start program. The first section will examine the validity of the low birthweight birth rate dataset. The next section will look at the identification process. The third section will describe the estimation and diagnosis components. The final section will describe the results of the intervention analysis.

Dataset Validity

Using the raw data reported on birth certificates to the Florida Office of Vital Statistics, low birthweight birth rates were calculated for nonwhite women on a county basis by month between January 1988 and December 1996. Table 4 is a description of the data for each variable in the dataset. The table was generated using the PROC PRINT command in SAS in order to verify that the rates were appropriately calculated. Variables MONTH and YEAR represent January through December for each year of the analysis. Variable TOTNWB represents the total nonwhite live births for each observation; variable NWLBWB represents the total nonwhite low birthweight births (birthweight less than 2,500 grams) for each observation; variable NWLBWR represents the division of NWLBWB by TOTNWB and multiplied by 1,000 to standardize the product as a rate; SASDATE represents the SAS transformation of the MONTH and YEAR variables in order to chronologically order the observations; and STEPVAR represents the dichotomous variable that indicates the observations which occur before and after the intervention of the Healthy Start program. The purpose of examining the dataset in this fashion is to ensure that the variables accurately represent the observations.

Table 4 -- PROC PRINT output of Healthy Start dataset

08S	MONTH	YEAR	TOTNWB	NWL8W8	NWL8WR	SASOATE	STEPVAR
1	1	88	4012	464	115.853	JAN88	0
2	2	88	3807	397	110.064	FE888	0
3	3	88	3821	432	119.304	MAR88	0
4	4	88	3311	443	133.798	APR86	0
5	5	86	3386	461	138.149	MAY86	0
6	8	88	3653	507	138.790	JUN88	0
7	7	88	4150	561	135.181	JUL88	0
6	8	88	4592	576	125.438	AUG88	0
9	9	88	4440	555	125.000	SEP88	0
10	10	68	4215	512	121.471	OCT88	0
11	11	88	4207	519	123.366	NOV68	0
12	12	88	4128	478	115.795	0EC88	0
13	1	89	4141	507	122.434	JAN89	0
14	2	69	3737	442	118.277	FEB89	0
15	3	89	4119	471	114.348	MAR89	0
16	4	89	3521	497	141.153	APR89	0
17	5	89	3702	465	125.608	MAY89	0
18	6	89	3775	540	143.048	JUN89	0
19	7	89	4384	533	121.578	JUL89	0
20	8	89	4701	587	120.613	AUG89	0
21	9	89	4555	577	128.674	SEP89	0
22	10	89	4533	592	130.598	OCT89	0
23	11	89	4300	512	119.070	NOV89	0
24	12	89	4439	532	119.847	0EC89	0
25	1	90	4429	502	113.344	JAN90	0
26	2	90	3818	428	111.577	FE890	0
27	3	90	4008	431	107.589	MAR90	0
28	4	90	3767	455	120.786	APR90	0
29	5	90	4041	537	132.686	MAY90	0
30	6	90	3878	463	119.453	JUN90	0
31	7	90	4369	539	123.369	JUL90	0
32	8	90	4877	825	133.633	AUG90	0
33	9	90	4814	514	106.772	SEP90	0
34	10	90	4832	560	120.698	OCT90	0
35	11	90	4375	520	116.657	NOV90	0
38	12	90	4618	551	119.318	0EC90	0
37	1	91	4492	512	113.980	JAN91	0
38	2	91	3784	392	103.594	FE891	0
39	3	91	3974	451	113.488	MAR91	0
40	4	91	3832	475	123.958	APR91	0
41	5	91	3903	471	120.678	MAY91	0
42	6	91	3913	499	127.524	JUN91	0
43	7	91	4311	529	122.709	JUL91	0
44	8	91	4810	590	122.661	AUG91	0
45	9	91	4808	541	117.455	SEP91	0
46	10	91	4544	548	120.599	OCT91	0
47	11	91	4267	501	117.413	NOV91	0
48	12	91	4490	497	110.690	0EC91	0
49	1	92	4263	486	113.472	JAN92	0

Table 4 -- continued.

08S	MONTH	YEAR	TOTNW8	NWL8WB	NWL8WR	SASDATE	STEPVAR
50	2	92	3735	370	99.063	FE892	0
51	3	92	4055	431	108.289	MAR92	0
52	4	92	3832	435	113.518	APR92	0
53	5	92	3864	460	119.048	MAY92	1
54	6	92	4079	509	124.785	JUN92	1
55	7	92	4416	542	122.738	JUL92	1
56	8	92	4488	565	126.511	AUG92	1
57	9	92	4601	494	107.388	SEP92	1
58	10	92	4568	522	114.273	OCT92	1
59	11	92	4384	516	117.701	NOV92	1
80	12	92	4492	501	111.532	OEC92	1
81	1	93	4467	518	115.961	JAN93	1
82	2	93	3951	406	102.759	FE893	1
63	3	93	4082	414	101.421	MAR93	1
84	4	93	3674	423	115.133	APR93	1
65	5	93	3934	457	118.187	MAY93	1
86	8	93	3920	491	125.255	JUN93	1
67	7	93	4465	553	123.852	JUL93	1
88	8	93	4547	532	117.000	AUG93	1
69	9	93	4625	497	107.459	SEP93	1
70	10	93	4368	480	109.890	OCT93	1
71	11	93	4331	544	125.606	NOV93	1
72	12	93	4632	537	115.933	OEC93	1
73	1	94	4506	471	104.527	JAN94	1
74	2	94	3998	472	118.118	FE894	1
75	3	94	4102	458	111.185	MAR94	1
76	4	94	3691	448	121.378	APR94	1
77	5	94	3837	452	117.800	MAY94	1
78	6	94	3941	492	124.841	JUN94	1
79	7	94	4158	539	129.630	JUL94	1
80	8	94	4487	555	123.891	AUG94	1
81	9	94	4608	549	119.141	SEP94	1
82	10	94	4469	524	117.252	OCT94	1
83	11	94	4117	464	112.703	NOV94	1
84	12	94	4374	485	110.882	OEC94	1
85	1	95	4119	448	108.279	JAN95	1
86	2	95	3698	422	114.177	FE895	1
87	3	95	3970	461	116.121	MAR95	1
88	4	95	3722	392	105.320	APR95	1
89	5	95	3808	458	119.811	MAY95	1
90	6	95	4002	489	122.189	JUN95	1
91	7	95	4145	470	113.390	JUL95	1
92	8	95	4537	517	113.952	AUG95	1
93	9	95	4632	493	108.434	SEP95	1
94	10	95	4566	499	109.288	OCT95	1
95	11	95	4327	497	114.860	NOV95	1
96	12	95	4359	510	118.999	OEC95	1
97	1	96	4224	463	109.612	JAN98	1
98	2	96	3750	427	113.867	FE896	1
99	3	96	3810	400	104.987	MAR96	1
100	4	96	3740	412	110.160	APR96	1
101	5	96	3870	480	124.031	MAY96	1
102	6	96	3782	489	129.297	JUN96	1
103	7	98	4178	488	118.802	JUL96	1

Table 4 -- continued.

OBS	MONTH	YEAR	TOTNWB	NWLBWB	NWLBWR	SASDATE	STEPVAR
104	8	96	4585	571	124.537	AUG96	1
105	9	96	4660	492	105.579	SEP96	1
106	10	96	4615	516	111.809	OCT96	1
107	11	96	4454	531	119.219	NOV96	1
108	12	96	4651	514	110.514	DEC96	1

Random manual calculations of the rates indicate that the calculated rates, SAS dates, and intervention variable accurately reflect the observed data. Figure 19 uses the PROC GPLOT procedure in SAS to graphically represents the low birthweight birth rates by SASDATE. A superficial examination of Figure 18 suggests a downward trend in the data with some seasonal variablility.

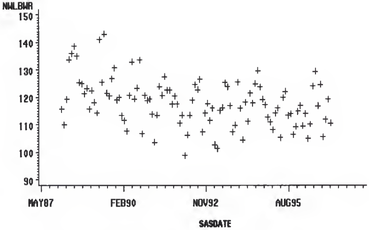


Figure 19 -- PROC GPLOT output of NWLBWR by SASDATE

ARIMA: Identification process

As previously discussed, the ARIMA procedure requires the researcher to move through a four step process: identification, estimation, diagnosis, and intervention testing.

The *identification* process involves examining the ACF and PACF produced by the ARIMA procedure to look at the patterns of "spikes" and "decay" in the time series. The first step of the identification process is to examine the data for stationarity. This is determined by examining the ACF in the model output. A time series which is nonstationary will produce an ACF output with a significant "spike" (that is, a spike which exceeds the dots which mark two standard errors for the sample correlation at each lag p, based on a null hypothesis that all correlations at are beyond lag p are 0) at the lag p covariance correlation that slowly decays over several lags (usually more than 12 lags)(SAS Institute, 1996). Similarly, an ACF with a significant spike which exponentially decreases over a few lags is said to be stationary. Figure 20 is the PROC ARIMA ACF, inverse autocorrelations (IACF), and PACF output for the Healthy Start program dataset.

```
                                   ARIMA Procedure
                               Name of variable = NWLBWR.

                               Mean of working series = 118.0701
                               Standard deviation     = 8.549557
                               Number of observations =      108

                                    Autocorrelations
Lag Covariance Correlation -1 9 8 7 8 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1         Std
  0  73.094922     1.00000 |                    |********************|          0
  1  32.111580     0.43931 |                .   |*********           |   0.096225
  2  20.328403     0.27808 |               .    |******              |   0.113284
  3   9.149055     0.12517 |               .    |*** .               |   0.119437
  4  -3.950098    -0.05404 |               .   *|    .               |   0.120646
  5   2.322399     0.03177 |               .    |*   .               |   0.120870
  6   1.319933     0.01808 |               .    |    .               |   0.120947
  7   0.872628     0.01194 |               .    |    .               |   0.120972
  8   0.704321     0.00964 |               .    |    .               |   0.120983
  9  -1.243406    -0.01701 |               .    |    .               |   0.120990
 10  14.702370     0.20114 |               .    |****.               |   0.121012
 11  26.074374     0.35872 |               .    |*******             |   0.124069
 12  34.384388     0.47041 |               .    |*********           |   0.133228
 13  28.324048     0.36014 |              .     |*******             |   0.147809
 14  11.513042     0.15751 |              .     |***  .              |   0.155722
 15   4.605476     0.06301 |              .     |*    .              |   0.157190
 18  -5.359033    -0.07332 |              .    *|     .              |   0.157424
```

Figure 20 -- PROC ARIMA output for the Healthy Start dataset

```
17 -10.615549   -0.14523 |               .  ***|     .             | 0.157739
16  -2.996695   -0.04100 |               .    *|     .             | 0.156973
19  -7.143867   -0.09773 |               .   **|     .             | 0.159071
20  -7.317394   -0.10011 |               .   **|     .             | 0.159626
21  -8.026884   -0.08245 |               .   **|     .             | 0.160206
22   5.030155    0.06882 |               .     |*    .             | 0.160598
23  15.710346    0.21493 |               .     |**** .             | 0.160871
24  26.123848    0.35740 |              .      |*******             | 0.183508
                              "." marks two standard errors
```

```
                     Inverse Autocorrelations

Lag Correlation -1 9 8 7 8 5 4 3 2 1 0 1 2 3 4 5 8 7 8 9 1
  1    -0.13006 |                .***|   .                |
  2    -0.15658 |                .***|   .                |
  3    -0.12097 |                . **|   .                |
  4     0.20670 |                .   |****                |
  5    -0.01905 |                .   |   .                |
  8    -0.09408 |                . **|   .                |
  7    -0.12743 |                .***|   .                |
  8     0.01133 |                .   |   .                |
  9     0.14405 |                .   |***.                |
 10    -0.07032 |                .  *|   .                |
 11    -0.16103 |                .***|   .                |
 12    -0.12398 |                . **|   .                |
 13     0.09121 |                .   |** .                |
 14     0.05642 |                .   |*  .                |
 15    -0.10685 |                . **|   .                |
 18    -0.02747 |                .  *|   .                |
 17     0.18831 |                .   |****                |
 18    -0.02094 |                .   |   .                |
 19     0.00919 |                .   |   .                |
 20    -0.04247 |                .  *|   .                |
 21     0.11172 |                .   |** .                |
 22     0.00943 |                .   |   .                |
 23     0.03319 |                .   |*  .                |
 24    -0.13608 |                .***|   .                |
```

```
                        ARIMA Procadure


                     Partial Autocorrelations

Lag Correlation -1 9 8 7 8 5 4 3 2 1 0 1 2 3 4 5 8 7 8 9 1
  1     0.43931 |                .   |*********           |
  2     0.10543 |                .   |** .                |
  3    -0.03814 |                .  *|   .                |
  4    -0.15117 |                .***|   .                |
  5     0.12315 |                .   |** .                |
  8     0.01710 |                .   |   .                |
  7    -0.01847 |                .   |   .                |
  8    -0.02911 |                .  *|   .                |
  9     0.00172 |                .   |   .                |
```

Figure 20 -- continued.

```
10     0.28282  |                            . |******                    |
11     0.27148  |                            . |*****                     |
12     0.25031  |                            . |*****                     |
13    -0.02775  |                            .    *|     .                |
14    -0.10138  |                            .   **|     .                |
15     0.00121  |                            .     |     .                |
18    -0.07249  |                            .    *|     .                |
17    -0.18384  |                            ****|     .                  |
18     0.01737  |                            .     |     .                |
19    -0.03035  |                            .    *|     .                |
20    -0.05169  |                            .    *|     .                |
21    -0.09818  |                            .   **|     .                |
22     0.08005  |                            .     |*    .                |
23     0.04742  |                            .     |*    .                |
24     0.18652  |                            .     |****                  |
```

Autocorralation Check for White Noise

To Lag	Chi Square	OF	Prob	Autocorrelations					
8	32.36	6	0.000	0.439	0.278	0.125	-0.054	0.032	0.018
12	80.29	12	0.000	0.012	0.010	-0.017	0.201	0.357	0.470
18	103.82	18	0.000	0.360	0.158	0.063	-0.073	-0.145	-0.041
24	132.55	24	0.000	-0.098	-0.100	-0.082	0.089	0.215	0.357

Figure 20 -- continued.

Figure 20 indicates that the ACF for this time series tails off exponentially, although there is a strong sine wave pattern with spikes at the 12[th] and 24[th] lags as well. This indicates that the time series is stationary but has a strong seasonal pattern and possibly more than one autoregressive coefficient. The IACF has no significant spikes (that is, no spikes exceed the dots which mark the bounds of an approximate 95% confidence interval for the null hypothesis that the series is from a white noise process) which indicates that the process may have an autoregressive order of 1, although it is unlikely that it would be of any higher order. The PACF has a significant spike at lag 1 (that is, the spike exceeds the dots which indicate two standard errors for the partial autocorrelation at each lag p based on a null hypothesis that all partial correlations at or beyond lag p are 0) and additional spikes at 10, 11, and 12 which fall to 0 at the 13[th] lag.

This also suggests that the process may have an autoregressive order of 1. Finally, the *p*-values associated with the *Q*-statistic found in the Autocorrelation Check for White Noise table are significant which indicate that the time series is not simply white noise. In summary, the ACF indicates that the time series is stationary with a seasonal trend and possibly more than one autoregressive coefficient, while the IACF and PACF suggest a process with an autoregressive order of 1.

ARIMA: Estimation and Diagnosis

The next step in the ARIMA process is the *estimation* of the time series. This is the process of fitting the most probable model suggested by the identification process. Based on Figure 20, the most likely model is a seasonal autoregressive process, the ARIMA $(1,0,0)(1,0,0)_{12}$. The model states that the process contains a seasonal autoregressive coefficient and an additional autoregressive coefficient. These estimates are incorporated into the PROC ARIMA procedure which produced the output in Figure 20.

Figure 21 provides the ACF, IACF, PACF, and the Autocorrelation Check for White Noise table that was produced in Figure 20. In addition, Figure 21 provides statistical estimates which allow us to test the estimated model. The first estimate is of the Conditional Least Squares which provides the parameter estimates, approximate standard errors, *t*-ratios, and lags for the model. The constant estimate is $\mu\,(1 - \Phi_1 - \Phi_2 - \ldots - \Phi_p)$ when the model includes an AR (*p*) component. For this model, the constant estimate of 32.9844064 is equal to 119.45224 (1-.29678-.42709). The output also provides several measures of goodness of fit including a variance estimate, a standard-error estimate,

Akaike's Information Criterion (AIC), Schwarz's Bayesian Criterion (SBC). The smaller the values, the better the fit. In testing many other possible models, the goodness of fit

```
                           ARIMA Procedure
                      Name of variable = NWLBWR.

                      Mean of working series = 118.0701
                      Standard deviation     = 8.549557
                      Number of observations =      108

                              Autocorrelations

Lag Covariance Correlation -1 9 8 7 8 5 4 3 2 1 0 1 2 3 4 5 8 7 8 9 1       Std
  0  73.094922    1.00000  |                    |********************|         0
  1  32.111580    0.43931  |                .   |*********           |  0.096225
  2  20.326403    0.27808  |               .    |******              |  0.113284
  3   9.149055    0.12517  |               .    |***  .              |  0.119437
  4  -3.950098   -0.05404  |               .   *|     .              |  0.120646
  5   2.322399    0.03177  |               .    |*    .              |  0.120870
  6   1.319933    0.01806  |               .    |     .              |  0.120947
  7   0.872628    0.01194  |               .    |     .              |  0.120972
  8   0.704321    0.00964  |               .    |     .              |  0.120983
  9  -1.243408   -0.01701  |               .    |     .              |  0.120990
 10  14.702370    0.20114  |               .    |****.               |  0.121012
 11  26.074374    0.35672  |               .    |*******             |  0.124089
 12  34.384386    0.47041  |               .    |*********           |  0.133228
 13  28.324046    0.36014  |              .     |*******             |  0.147809
 14  11.513042    0.15751  |              .     |***   .             |  0.155722
 15   4.605476    0.06301  |              .     |*     .             |  0.157190
 18  -5.359033   -0.07332  |              .    *|      .             |  0.157424
 17 -10.615549   -0.14523  |              .  ***|      .             |  0.157739
 18  -2.998695   -0.04100  |              .    *|      .             |  0.158973
 19  -7.143867   -0.09773  |              .   **|      .             |  0.159071
 20  -7.317394   -0.10011  |              .   **|      .             |  0.159628
 21  -6.026684   -0.08245  |              .   **|      .             |  0.180208
 22   5.030155    0.06882  |              .     |*     .             |  0.160598
 23  15.710346    0.21493  |              .     |****  .             |  0.160871
 24  26.123848    0.35740  |             .      |*******             |  0.183508
                                   "." marks two standard errors

                              ARIMA Procedure

                          Inverse Autocorrelations

            Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
              1    -0.13006  |                .***|    .               |
              2    -0.15658  |                .***|    .               |
              3    -0.12097  |                . **|    .               |
              4     0.20670  |                .   |****                |
              5    -0.01905  |                .   |    .               |
```

Figure 21 -- PROC ARIMA output of Healthy Start dataset with estimates

```
  6     -0.09408 |               . **|   .               |
  7     -0.12743 |               .***|   .               |
  8      0.01133 |               .   |   .               |
  9      0.14405 |               .   |***.               |
 10     -0.07032 |               .  *|   .               |
 11     -0.16103 |               .***|   .               |
 12     -0.12398 |               . **|   .               |
 13      0.09121 |               .   |** .               |
 14      0.05842 |               .   |*  .               |
 15     -0.10665 |               . **|   .               |
 16     -0.02747 |               .  *|   .               |
 17      0.18831 |               .   |****               |
 18     -0.02094 |               .   |   .               |
 19      0.00919 |               .   |   .               |
 20     -0.04247 |               .  *|   .               |
 21      0.11172 |               .   |** .               |
 22      0.00943 |               .   |   .               |
 23      0.03319 |               .   |*  .               |
 24     -0.13608 |               .***|   .               |

                  ARIMA Procedure
               Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 8 7 8 9 1
  1      0.43931 |               .   |*********          |
  2      0.10543 |               .   |** .               |
  3     -0.03814 |               .  *|   .               |
  4     -0.15117 |               .***|   .               |
  5      0.12315 |               .   |** .               |
  6      0.01710 |               .   |   .               |
  7     -0.01847 |               .   |   .               |
  8     -0.02911 |               .  *|   .               |
  9      0.00172 |               .   |   .               |
 10      0.28282 |               .   |******             |
 11      0.27148 |               .   |*****              |
 12      0.25031 |               .   |*****              |
 13     -0.02775 |               .  *|   .               |
 14     -0.10138 |               . **|   .               |
 15      0.00121 |               .   |   .               |
 16     -0.07249 |               .  *|   .               |
 17     -0.18384 |               ****|   .               |
 18      0.01737 |               .   |   .               |
 19     -0.03035 |               .  *|   .               |
 20     -0.05169 |               .  *|   .               |
 21     -0.09816 |               . **|   .               |
 22      0.06005 |               .   |*  .               |
 23      0.04742 |               .   |*  .               |
 24      0.18852 |               .   |****               |
```

Figure 21 -- continued.

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	32.36	6	0.000	0.439	0.278	0.125	-0.054	0.032	0.018
12	80.29	12	0.000	0.012	0.010	-0.017	0.201	0.357	0.470
18	103.82	18	0.000	0.360	0.158	0.063	-0.073	-0.145	-0.041
24	132.55	24	0.000	-0.098	-0.100	-0.082	0.069	0.215	0.357

ARIMA Procedure

Conditional Least Squares Estimation

Parameter	Estimate	Approx. Std Error	T Ratio	Lag
MU	119.45224	1.92494	62.05	0
AR1,1	0.29678	0.08650	3.43	1
AR1,2	0.42709	0.09162	4.66	12

Constant Estimate = 32.9844064

Variance Estimate = 50.6924447
Std Error Estimate = 7.11986269
AIC = 733.432171*
SBC = 741.478565*
Number of Residuals= 108
* Does not include log determinant.

Correlations of the Estimates

Parameter	MU	AR1,1	AR1,2
MU	1.000	-0.008	0.081
AR1,1	-0.008	1.000	-0.393
AR1,2	0.081	-0.393	1.000

Autocorrelation Check of Residuals

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	7.08	4	0.132	-0.068	0.098	0.138	-0.102	0.137	0.007
12	15.83	10	0.105	0.034	0.100	-0.121	0.090	0.157	-0.118
18	20.20	16	0.211	0.068	-0.048	0.043	0.023	-0.136	0.077
24	23.32	22	0.384	-0.082	-0.042	-0.028	0.004	-0.023	0.113

Model for variable NWLBWR

Estimated Mean = 119.452237

Autoregressive Factors
Factor 1: 1 - 0.29878 B**(1) - 0.42709 B**(12)

Figure 21 -- continued.

estimates will help the researcher choose the best model possible. Additional information provided in the output includes the correlation matrix of the parameter estimates. Highly correlated parameter estimates may reduce the accuracy of the overall model. The Autocorrelation Check of Residuals table uses *Q*-statistics to test whether the residuals of the model are white noise. Finally, a summary of the estimated model is shown listing the estimated mean and the estimated autoregressive parameters in backshift notation (SAS Institute, 1996). Of the information included in the model estimate described in Figure 21, the most important is the Autocorrelation Check of Residuals table that shows no significance in the *Q*-statistics. This indicates that the residuals of the model are white noise, so the AR (1 12) model provides an adequate fit to the Healthy Start time series data.

<u>ARIMA: Intervention Component</u>

The most crucial aspect of the ARIMA process is the attempt to identify the impact of an intervention on the ability to predict future observations. The "transfer function" in the Box-Jenkins ARIMA procedure is the intervention component. A transfer component may take one of three patterns: 1) an abrupt, constant change in the series; 2) a gradual, constant change in the series; or 3) an abrupt, temporary change in the series (Cook and Campbell, 1979). In the selection of which function is most appropriate, the researcher may have an a priori notion of the nature of the process. In the model estimated in Figure 21, it is assumed that the change in the time series due to the implementation of the Healthy Start process will result in a gradual, constant change. In order to assess the fit of this model, the research must examine the significance of the

parameter estimates for the intervention component which is expressed in the NUM(1) and DENT (1,1) estimates in the conditional least squares estimations; examine the AIC and SBC components to find the model with the lowest values; check the correlations of the parameters and reject those that are highly correlated; and examine the autocorrelations of the residuals to ensure that they are not significant. Figure 22 includes the intervention model assuming that the Healthy Start program would have a gradual constant change in the time series.

```
                          ARIMA Procedure
                      Name of variable = NWLBWR.

                      Mean of working series = 118.0701
                      Standard deviation     = 8.549557
                      Number of observations =      108

                              Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1        Std
  0  73.094922     1.00000  |                    |********************|          0
  1  32.111580     0.43931  |                .   |*********           |   0.096225
  2  20.326403     0.27808  |               .    |******              |   0.113284
  3   9.149055     0.12517  |               .    |***  .              |   0.119437
  4  -3.950098    -0.05404  |               .   *|    .               |   0.120646
  5   2.322399     0.03177  |               .    |*   .               |   0.120870
  6   1.319933     0.01806  |               .    |    .               |   0.120947
  7   0.872628     0.01194  |               .    |    .               |   0.120972
  8   0.704321     0.00964  |               .    |    .               |   0.120983
  9  -1.243408    -0.01701  |               .    |    .               |   0.120990
 10  14.702370     0.20114  |               .    |****.               |   0.121012
 11  26.074374     0.35672  |               .    |*******             |   0.124069
 12  34.384386     0.47041  |               .    |*********           |   0.133228
 13  26.324046     0.36014  |              .     |*******             |   0.147809
 14  11.513042     0.15751  |              .     |***  .              |   0.155722
 15   4.605476     0.06301  |              .     |*    .              |   0.157190
 16  -5.359033    -0.07332  |              .    *|     .              |   0.157424
 17 -10.615549    -0.14523  |              .  ***|     .              |   0.157739
 18  -2.996695    -0.04100  |              .    *|     .              |   0.158973
 19  -7.143867    -0.09773  |              .   **|     .              |   0.159071
 20  -7.317394    -0.10011  |              .   **|     .              |   0.159628
 21  -6.026684    -0.08245  |              .   **|     .              |   0.180208
 22   5.030155     0.06882  |              .     |*    .              |   0.160598
 23  15.710346     0.21493  |              .     |**** .              |   0.180871
 24  28.123848     0.35740  |             .      |*******             |   0.163508
                                     "." marks two standard errors
```

Figure 22 -- PROC ARIMA output with intervention component

```
                         ARIMA Procedure

                     Inverse Autocorrelations

Lag Correlation -1 9 8 7 8 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1    -0.13006 |                .***|   .                |
  2    -0.15658 |                .***|   .                |
  3    -0.12097 |                . **|   .                |
  4     0.20670 |                .   |****                |
  5    -0.01905 |                .   |   .                |
  8    -0.09408 |                . **|   .                |
  7    -0.12743 |                .***|   .                |
  8     0.01133 |                .   |   .                |
  9     0.14405 |                .   |***.                |
 10    -0.07032 |                .  *|   .                |
 11    -0.16103 |                .***|   .                |
 12    -0.12398 |                . **|   .                |
 13     0.09121 |                .   |** .                |
 14     0.05642 |                .   |*  .                |
 15    -0.10665 |                . **|   .                |
 16    -0.02747 |                .  *|   .                |
 17     0.18831 |                .   |****                |
 18    -0.02094 |                .   |   .                |
 19     0.00919 |                .   |   .                |
 20    -0.04247 |                .  *|   .                |
 21     0.11172 |                .   |** .                |
 22     0.00943 |                .   |   .                |
 23     0.03319 |                .   |*  .                |
 24    -0.13608 |                .***|   .                |

                        ARIMA Procedure
                     Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.43931 |                .   |*********           |
  2     0.10543 |                .   |** .                |
  3    -0.03814 |                .  *|   .                |
  4    -0.15117 |                .***|   .                |
  5     0.12315 |                .   |** .                |
  6     0.01710 |                .   |   .                |
  7    -0.01847 |                .   |   .                |
  8    -0.02911 |                .  *|   .                |
  9     0.00172 |                .   |   .                |
 10     0.28282 |                .   |******              |
 11     0.27148 |                .   |*****               |
 12     0.25031 |                .   |*****               |
 13    -0.02775 |                .  *|   .                |
 14    -0.10138 |                . **|   .                |
 15     0.00121 |                .   |   .                |
 16    -0.07249 |                .  *|   .                |
 17    -0.18384 |                ****|   .                |
```

Figure 22 -- continued.

```
18    0.01737  |                .   |   .                |
19   -0.03035  |                .  *|   .                |
20   -0.05169  |                .  *|   .                |
21   -0.09816  |                . **|   .                |
22    0.06005  |                .   |*  .                |
23    0.04742  |                .   |*  .                |
24    0.18652  |                .   |****                |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	32.38	6	0.000	0.439	0.278	0.125	-0.054	0.032	0.018
12	80.29	12	0.000	0.012	0.010	-0.017	0.201	0.357	0.470
18	103.82	18	0.000	0.360	0.158	0.063	-0.073	-0.145	-0.041
24	132.55	24	0.000	-0.098	-0.100	-0.082	0.069	0.215	0.357

ARIMA Procedure

```
Correlation of NWL8WR and STEPVAR
Variable STEPVAR has been differenced.
Period(s) of Differencing = 1.
Variance of input = 0.009258
Number of observations =       107
NOTE: The first observation was eliminated by
      differencing.
```

Crosscorrelations

```
Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
-24   0.130151    0.15753  |                .   |***.                |
-23  0.0054488    0.00680  |                .   |   .                |
-22   0.042390    0.05131  |                .   |*  .                |
-21   0.138483    0.16762  |                .   |***.                |
-20  -0.111437   -0.13488  |                .***|   .                |
-19   0.020434    0.02473  |                .   |   .                |
-18  0.0010016    0.00121  |                .   |   .                |
-17  0.0056982    0.00690  |                .   |   .                |
-16  -0.043803   -0.05302  |                .  *|   .                |
-15  -0.139853   -0.16928  |                .***|   .                |
-14  -0.046620   -0.05643  |                .  *|   .                |
-13   0.051498    0.06233  |                .   |*  .                |
-12   0.020942    0.02535  |                .   |*  .                |
-11   0.085675    0.10370  |                .   |** .                |
-10   0.041051    0.04989  |                .   |*  .                |
 -9   0.041745    0.05053  |                .   |*  .                |
 -8 -0.0062127   -0.00752  |                .   |   .                |
 -7   0.022843    0.02741  |                .   |*  .                |
 -8 -0.0081099   -0.00982  |                .   |   .                |
 -5  -0.070822   -0.08572  |                . **|   .                |
 -4  -0.045390   -0.05494  |                .  *|   .                |
 -3  -0.178960   -0.21661  |                ****|   .                |
 -2  -0.110882   -0.13421  |                .***|   .                |
 -1  -0.043418   -0.05255  |                .  *|   .                |
  0  0.0089250    0.01080  |                .   |   .                |
```

Figure 22 -- continued.

```
  1   0.061649    0.07466  |                    .   |*  .                |
  2   0.042796    0.05160  |                    .   |*  .                |
  3   0.079456    0.09617  |                    .   |** .                |
  4  -0.097677   -0.11647  |                    . **|   .                |
  5  -0.031535   -0.03617  |                    .  *|   .                |
  6  0.0019906    0.00241  |                    .   |   .                |
  7  -0.055023   -0.06660  |                    .  *|   .                |
  8  -0.013019   -0.01576  |                    .   |   .                |
  9  -0.136114   -0.16475  |                    .***|   .                |
 10  -0.146157   -0.17933  |                    ****|   .                |
 11  -0.020204   -0.02445  |                    .   |   .                |
 12  -0.010167   -0.01231  |                    .   |   .                |
 13   0.074767    0.09052  |                    .   |** .                |
 14   0.061349    0.07426  |                    .   |*  .                |
 15  -0.000674   -0.00082  |                    .   |   .                |
 16  -0.089164   -0.10795  |                    . **|   .                |
 17  -0.064268   -0.07761  |                    . **|   .                |
 16   0.062695    0.10034  |                    .   |** .                |
 19 -0.0072906   -0.00662  |                    .   |   .                |
 20  -0.113133   -0.13694  |                    .***|   .                |
 21   0.014976    0.01613  |                    .   |   .                |
 22  -0.049918   -0.06042  |                    .  *|   .                |
 23   0.045665    0.05527  |                    .   |*  .                |
 24   0.011630    0.01432  |                    .   |   .                |
                                  "." marks two standard errors

                             ARIMA Procedure

                    Conditional Least Squares Estimation

                                 Approx.
   Parameter     Estimate      Std Error    T Ratio  Lag  Variable  Shift
   MU           120.26219        2.05170      56.62    0  NWL6WR        0
   AR1,1          0.29457        0.08791       3.35    1  NWL8WR        0
   AR1,2          0.45163        0.09398       4.61   12  NWL6WR        0
   NUM1           0.90100        6.48183       0.14    0  STEPVAR       0
   OEN1,1         0.51486        5.18663       0.10    1  STEPVAR       0

   Constant Estimate  = 30.5226244

   Veriance  Estimate = 51.5655835
   Std Error Estimate = 7.16231046
   AIC                = 723.676878*
   SBC                = 736.994073*
   Number of Residuels=        106
   * Does not include log determinant.
```

Figure 22 -- continued.

Correlations of the Estimates

Variable	Parameter	NWL8WR MU	NWL8WR AR1,1	NWLBWR AR1,2	STEPVAR NUM1	STEPVAR OEN1,1
NWLBWR	MU	1.000	0.007	0.123	-0.020	-0.049
NWLBWR	AR1,1	0.007	1.000	-0.424	0.050	-0.003
NWL8WR	AR1,2	0.123	-0.424	1.000	-0.029	-0.054
STEPVAR	NUM1	-0.020	0.050	-0.029	1.000	-0.287
STEPVAR	OEN1,1	-0.049	-0.003	-0.054	-0.287	1.000

Autocorrelation Check of Residuals

To Lag	Chi Square	OF	Prob	Autocorrelations					
8	9.34	4	0.053	-0.084	0.108	0.165	-0.082	0.176	0.019
12	18.11	10	0.053	0.031	0.087	-0.121	0.077	0.174	-0.118
18	22.23	16	0.136	0.060	-0.008	0.038	0.069	-0.138	0.057
24	24.72	22	0.311	-0.064	-0.003	-0.024	0.012	-0.028	0.112

ARIMA Procedure

Model for variable NWL8WR

Estimated Intercept = 120.262194

Autoregressive Factors
Factor 1: 1 - 0.29457 B**(1) - 0.45163 8**(12)

Input Number 1 is STEPVAR.
Period(s) of Oifferencing = 1.
Overall Regression Factor = 0.901

The Oenominator Factors are
Factor 1: 1 - 0.51486 B**(1)

Figure 22 -- continued.

Figure 22 indicates that the intervention variable has no significant predictive value in the previously modeled process. The T-ratios for the intervention parameters on non-significant. This requires the research to remove the component from the model (resulting in a model described in Figure 21). Figure 22 suggests that the implementation of the Healthy Start program has not had an impact on the rates of low birthweight births in the nonwhite population in Florida.

Results Summary– State Level Analysis

The Box-Jenkins ARIMA procedure indicates that the low birthweight birth rates in Florida have a strong seasonality and an autoregressive order of 1 resulting in an ARIMA $(1,0,0)(1,0,0)_{12}$ process. The Healthy Start implementation intervention did not have a statistically significant impact on the observations in the time series.

CHAPTER 4
METHODS AND RESULTS: SUBSTATE SURVEY AND ANALYSIS

While the results of the first study indicate that there has been no overall effect in the rate of poor birth outcomes in Florida as a result of the implementation of the Healthy Start program, there is a possibility that there may be a difference at the sub-state level. The second study uses two analyses to examine if there have been differences in the way that the Healthy Start program has been administered among the program administrative units (coalitions), and if these differences produced an impact on low birthweight rates in the nonwhite population. Specifically, a telephone survey of randomly selected coalitions was conducted to identify any differences in factors that have been identified in the literature as influencing the successful implementation of public policies. This chapter will describe the survey and its results, as well as discuss the results of ARIMA analyses conducted for each of the sampled coalitions.

Survey of Healthy Start Experts

In order to understand difference in implementation of the program, the second study consisted of a telephone survey of coalitions randomly selected from within two groups (the first group contained rural coalitions and the second contained urban coalitions). The survey questions attempted to assess factors from the implementation literature that may impact the successful implementation of the program. These factors included: differences in leadership style of the administrators; staff professionalism; commitment of Board representatives; decision-making processes of the Board; resource

utilization; severity of the poor birth outcome problem relative to other parts of the state; relationships with providers; and areas of conflict with both public and private providers. Several questions were asked for each implementation factor to ensure that the concept was captured (see Appendix).

Participants

As previously stated, the thirty Healthy Start coalitions were divided into two groups based on whether the coalition was rural or urban. The coalitions were divided on the basis because there is some evidence that each type of coalition may face special service delivery barriers that may make implementation more or less difficult. The first group consisted of those coalitions whose counties are predominately urban (i.e., most of the counties within the coalition are urban in nature), while the second group consisted of those coalitions whose counties are predominately rural (i.e., most of the counties within the coalition are rural in nature). The urban/rural designation was based on whether or not the majority of the counties in the coalition were Primary Metropolitan Statistical Areas (PMSAs). This differs significantly from other efforts that looked at standard Metropolitan Statistical Areas (MSA). The problem associated with using standard MSA designation is that it over inflates the number of very rural counties that are considered urban. The PMSA designation better allows researchers to divide areas on a rural/urban basis.

Five coalitions from each group were randomly selected for participation in the study. The primary decision-makers in each coalition were the target survey respondents, mostly consisting of the executive director or director of the program for the coalition area. In addition to the information obtained through the survey instrument, additional

descriptive and quantitative data for each coalition was used to supplement the analysis. This additional information was primarily obtained through the following sources:

- Bureau of Economic and Business Research. (1998). 1998 Florida Statistical Abstract: Thirty-Second Edition. Warrington College of Business Administration. Gainesville: University of Florida.
- Florida Department of Health. (1999). Florida's Maternal & Child Health Handbook: 1998 Accomplishments. Office of Maternal and Child Health Sources, Family Heath Services. Tallahassee: State of Florida.
- Florida Agency for Health Care Administration and the Florida Department of Health. (1998). 1997 Florida Health Data Source Book. Gainesville: Health Planning Councils of Florida.
- Florida Department of Health and Rehabilitative Services. (1996). Florida's Healthy Start: 1994-1995 Annual Report. State Health Office, Family Health Services. Tallahassee: State of Florida.

Survey Results

The following section will examine the survey respondents and their comments. For purposes of privacy and confidentiality, each of the coalitions surveyed will only be identified by an alphabetic character. Survey respondents were told that their specific responses would be kept confidential and that every effort would be made to de-identify their information before release of this study. Respondents were also made aware of the possibility that a person very familiar with the program could possibly link some information back to a particular respondent. Each respondent was notified of their right to refuse to answer any question and to quit the survey at anytime. While some chose to not answer particular questions, all respondents completed the survey.

Description of survey respondents

Based on the urban/rural designation of the study, decision-makers from a total of five urban and five rural coalition responded to the survey. These decision-makers

represented coalitions from all areas of the state including south Florida, central Florida, the Big Bend area, and the Panhandle. Among the ten coalitions, twenty-six of the sixty-seven counties (39%) in Florida were represented. The rural coalitions primarily consisted of multi-county coalitions (3 of 5), while the urban coalitions were exclusively single-county coalitions. The population size varied among the counties in the survey from under 10,000 to over one and a half million. The total population size for the survey was almost 4 million (27% of Florida's population). The large discrepancy in the survey respondents between the percentage of counties represented (39%) and the population of Florida represented (27%) demonstrates the skewed nature of the response with an overrepresentation of rural counties.

Table 5 -- Description of surveyed coalitions

Coalition	Population	Percent in Poverty %	Nonwhite LBW Rate/1,000 Births	Infant Mortality Rate/1,000 Births	Percent White %
A-Rural	718,684	21.2	125.80	10.9	75.9
B-Rural	169,184	18.9	127.43	11.8	82.3
D-Rural	464,780	16.3	127.15	8.9	88.0
G-Rural	84,743	11.5	159.30	4.4	92.3
H-Rural	34,746	21.8	129.63	10.4	91.1
C-Urban	1,470,758	12.3	111.90	9.7	80.3
E-Urban	291,135	20.3	113.83	8.4	73.3
F-Urban	116,359	10.8	95.24	12.3	91.8
I-Urban	315,785	14.6	89.11	6.8	96.5
J-Urban	301,644	9.9	109.27	10.2	94.0

As can be seen in Table 5, the rural coalitions, as a whole, are more likely to have a large portion of the population living under the poverty level, are more likely to have a larger nonwhite population, and have worse low birthweight rates and infant mortality rates. The rural coalitions range in size from about 35,000 to 719,000 residents, as

compared to the urban coalitions which have between approximately 115,000 and 1.5 million residents. Although there is wide variability in the severity of poor birth outcome rates among the counties in the surveyed coalitions, the severity of the outcomes in the rural coalitions overall is significantly worse than in the urban coalitions. Rural coalitions in the survey had low birthweight rates for nonwhites in 1996 ranging from 125.8 per 1,000 live births and 159.3 per 1,000. Urban coalitions had a much lower low birthweight rate range, moving between 89.11 per 1,000 live births and 113.83 per 1,000. In fact, the ranges for the rural and urban coalitions never come close to one another. This variability was most extreme in the smallest coalitions, where a single low birthweight birth could double the outcome rate from the previous year. In general, however, it is possible to state that the more rural the coalition in the survey, the higher the low birthweight rates for the nonwhite population in their service area.

Another interesting finding illustrated in Table 5 is the similarity of infant mortality rates among the rural and urban coalitions in the survey. While the low birthweight rates for the nonwhite population varied significantly between the two groups, the infant mortality rates for the entire population have a great deal of overlap. This is perhaps one of the best examples of why poor birth outcome measures should be focused on the most defined group possible (e.g., nonwhite vs. white or total population). In the case of the infant mortality rates for the entire population, the rates correspond directly with the levels of poverty in the rural counties. As the percentage of the population living under the level of poverty increases in the rural coalitions, the level of infant mortalities increases, as well. This is not true in the urban counties where there is no association between poverty levels and infant mortality rates.

Implementation Factor Differences in the Surveyed Coalitions

As stated earlier, the main purpose of the telephone survey was to assess whether there are differences in the implementation factors used among the coalitions, either overall or by rural/urban designation.

Coalition Structure

The first set of questions in the survey examined the structure of the coalitions including the number of counties in the respondent's coalition, the year that the program was incorporated and whether the administrator considered the coalition as mostly rural, both rural and urban, or mostly rural. The purpose of these questions was to determine if differences among the coalitions in relation to the age and population density could help or hinder implementation.

All of the coalitions were incorporated in the same year, although a number of them evolved from other maternal and infant programs previously administered in the area. After the introduction of the Healthy Start program, these groups changed their names and were recognized as coalitions. All survey respondents identified their coalitions in the same manner as this research (i.e., rural or urban); that is, all coalition decision-makers identified by the author's original division of the coalitions as rural or urban corresponded with the respondent's classification, thus validating the segmentation methodology used in this study. Of some interest, however, is that many of the "urban" coalition respondents stated that they had large geographical areas which could be considered rural, and that face many of the same difficulties in service delivery as fully rural coalitions (e.g., transportation problems, difficulty in conducting outreach programs, etc.). Because there was a lack of significant differences among the coalitions in relation

to these factors, it is unlikely that there would be differences in implementation among these coalitions.

Board of Directors Description and Activities

The next set of questions looked at how the coalitions' Boards of Directors are structured, how and what type of decisions are made, and how strong leadership and continuity are among the Board members. The implementation literature would suggest that strong, consistent leadership coupled with a consistent and clear decision-making process would help ensure successful program implementation. Furthermore, the less the conflict in decision making, the greater the likelihood that the policy will be successfully implemented.

According to the survey respondents, some coalitions in the survey had as few as twelve actual Board members, while others had as many as 30. The number of board members did not necessarily increase with the urban/rural classification of the coalition, with some of the most rural coalitions having some of the largest boards, in terms of formal board seats available. None of the coalitions surveyed were without vacant board seats. Board vacancies were seen as a problem in most of the coalitions. Respondents stated that there was an average of 10% of board positions open at any given time and 5 to 10% turnover each year. Another problem identified by respondents was board member participation. Many coalitions have problems with board member attendance and have found it difficult to hold meetings at times due to a lack of a quorum. This has created significant problems when trying to establish new policies or approving changes to existing policies. Only a few of the survey respondents had term limitations for their board members expressly stated in the coalition's bylaws, although most had limits on the

number of terms which could be served by the officers of the board. As a result of these structural components of the board, most of the coalitions have a long institutional history in their current membership.

It could be assumed from the literature that this stability would contribute to more consistent and effective policy decisions and greater commitment by the leaders of the coalitions, factors deemed important for successful implementation of public programs; however, this does not seem to be the case. The lack of regular attendance by all board members coupled with the high levels of participation of service providers as voting members of the Board of Directors in many of the coalitions, has created significant problems. Especially at times when budgetary allocations are being addressed, some coalitions are forced to have as few as three board members voting on appropriations, due to the requirement that those with a conflict of interest must abstain from voting. In order to address this problem, many coalitions have limited public health system representation on their boards through their bylaws. Since the county public health units are the primary Healthy Start service providers in most of the surveyed coalitions, this has resulted in language in the coalitions' bylaws limiting health department representation to only one voting member.

Survey respondents indicated that there was some variability in the types of issues most frequently addressed by their coalitions, although these differences did not align with the urban/rural delineation. The two most common issues addressed by the surveyed coalitions concerned program development issues (e.g., which target population should be of primary focus, which type of outreach system should be utilized, etc.) and service delivery issues (e.g., how to code for services, sharing of best practices, etc.).

The amount of time spent on the service delivery issues seems dependent on the percentage of providers on the board. Those surveyed coalitions with the highest percentage of providers as board members consistently cited service delivery issues as the primary issue addressed by the coalition. Some coalitions have found this to be a hindrance, and have addressed the issue by creating separate provider committees where service delivery issues are addressed exclusively. Other coalitions have rotating agendas that serve to keep the board from "bogging down" on the same issue for a long period of time.

The decision-making process in the responding coalitions tend to break into two types, again, not dependent on the urban/rural delineation. The most common style of decisions making in the coalitions includes: slightly formal discussion of issues; fairly long discussions; some questioning of staff recommendations; some standing and some ad hoc committees; a mix of consensus and counted voting; with some issues requiring more than one meeting to come to agreement. This style was followed with a more formal decision-making process in some of the surveyed coalitions including: formal presentation and discussion of issue; lengthy discussion; considerable analysis and questioning of staff work; multiple committees; mostly counted votes; and most issues take more than one meeting to come to agreement. Only one coalition responded that the decision-making process was informal in nature.

There was no one consistent issue that tended to create the most conflict within the surveyed coalitions. Issues of most significant conflict included: the inability or inflexibility of providers to respond to coalition requests for information or changes in service delivery; the lack of "new blood" to bring fresh ideas to the board which resulted

in the same issues being addressed repeatedly, with the same outcomes; and conflicts over which target population should receive primary attention by the program and how it will be accomplished.

Staff Composition and Professionalism

The next set of questions examined the composition of the coalition staff and their levels of education and training. The implementation literature suggests that a highly educated, professional staff improves the chances that a public policy will be successfully implemented. These questions try to assess the level of professionalism within the responding coalitions.

Coalition staff varied widely among the responding coalitions with as few as one professional, full-time employee with secretarial support, to as many as seven professionals and three part-time employees. All of the executive directors and most of the program directors surveyed had advanced graduate degrees (at least Masters degrees), while most support staff usually had more limited college education. The most widely represented professional backgrounds were social work and public administration. Most of the respondents have been in their current positions since the incorporation of the coalitions, although there has been some recent changes among some of the executive directors over the last year.

With the exception of overall staff size, there were few differences among the coalitions in terms of staff professionalism. For this reason, it is unlikely that these factors would responsible for any differences in program success or failure.

Healthy Start Population

The next questions examined the target population within the coalition service area. Based on the implementation literature, the program has a greater probability of successful implementation if the population can be clearly identified, the problem is well understood, and there are specific interventions that can be employed to combat the problem. Based on this literature framework, the goal of these questions was to assess the perceived severity of the problem and how that population views the Healthy Start program overall.

According to the survey, the number of prenatal and infant clients varied similar to the size of the overall population, although some coalitions had high enrollment numbers relative to the average of all those coalitions responding. The most common reason for eligibility in the program are conditions associated with poverty including: race, age (teenage births), frequent moves (especially for those coalitions with large migrant worker populations), and reasons for other than score (which may be only one risk factor whose severity is so great that services are recommended and offered). Many coalitions responded that it was difficult to identify any single risk factor that was most common because they are so interrelated that they are present for most of the population. Although most respondents felt that the severity of the poor birth outcome problem in their coalition area was similar to that in other coalitions, the exceptions were those coalitions with large migrant worker populations. These respondents believe that the problem is very severe in these high-risk populations and that they have the least ability to serve these groups because of their movements. In effect, these coalitions receive the mothers and infants at various stages of pregnancy with little information about previous

medical treatment. At the same time, if the mother gives birth within the county or if an infant from this population dies within the county, those outcomes are associated with the county in which the poor outcome occurred, rather than where any perinatal care may have been provided.

Most eligible individuals receive information about the Healthy Start through their provider of medical care. Although most of the coalitions responded that outreach and community education are attempted, they felt that word-of-mouth was still the most common form of clients receiving education about the program. All but one of the respondents felt that the target population identified the Healthy Start program with the public health care system exclusively (the only exception responded that the program was viewed as a mixture of private and public within their service area). No coalition responded that the program was viewed primarily as a private program.

Healthy Start Services

The majority of respondents offered all of the standard healthy start services discussed in previous sections. Although the majority of the coalitions used their funds to provide these services exclusively, others pooled resources with public health agencies and private non-for-profit groups to provide some of the services. Beside the standard Healthy Start service, some coalitions provide infant first aid and CPR classes; infant massage classes; and family planning services under the funds of the program. The respondents consistently identified care coordination as the most beneficial Healthy Start service provided and most felt that additional resources were needed to make significant impacts on severe populations.

Service Providers

The final set of questions examined the relationship between providers and the coalitions. Because the program was initially established by the State of Florida through the Department of Health and Rehabilitative Service (HRS), Healthy Start funds were provided directly from the state to the county public health units until such time as the coalitions became incorporated and produced a service delivery plan. When the plan was approved by the state, the coalition was officially recognized and the Board of Directors obtain control over funding allocations. As a consequence, most of the primary service providers in the responding coalitions are from the public health care system, specifically the county public health units. While this system is working well in most of the coalitions, some respondents said that it created a great deal of conflict when, as the coalition matured, more and more calls for accountability and proof of positive outcomes were sounded. This has led to considerable restructuring in some coalitions and threats to open the funds up to request for proposals at large.

The coalitions have similar ways of monitoring service providers. Most hold regular meetings with providers, require regular formal reports, and conduct onsite visits and audits. Although used very rarely among respondents, all coalitions have the same sanctions for provider who fail to meet expected performance expectations. The non-renewal or cancellation of the service contract was the most drastic form of sanction, although this is usually only exercised after a performance plan is enacted and fails to correct the problems.

Decision-Maker Survey Results Summary

In general, the survey respondents were similar in most aspects. There were no differences in implementation factors among the rural and urban coalitions, or the coalitions as a whole. Except for slight differences in high-risk populations and how the actual Boards of Directors are structured, there were no identified differences in how the actual delivery of Healthy Start services occur. There were also no differences associated with the coalition being either rural or urban. For this reason, it is unlikely that there will be any significant differences in the poor birth outcome rates in the surveyed coalitions as a result of the implementation of the Healthy Start program in those counties.

Methods and Results: Substate ARIMA Analyses

Although the telephone survey did not find significant differences in the factors associated with the program's implementation, a more quantitative analysis may determine variability in implementation at this substate level. This section describes the analyses used to examine low birthweight rates in the ten coalitions included in the survey. The purpose of these analyses is to determine whether there has been any changes among the counties in maternal and infant health conditions since the inception of the Healthy Start program in 1992. This will be achieved by employing the same interrupted time-series design that was used to examine these birth outcomes at the state level, the Box-Jenkins ARIMA time series analysis.

Hypothesis

This third study assesses whether Florida's Healthy Start program has met its program goals of reducing poor birth outcomes in high-risk women in ten coalitions

responding to a telephone survey conducted in 1999. The central hypotheses being tested in these analyses are as follow:

> ***H_o: The Florida Healthy Start program has reduced the rate of low birthweight births within the target population in each of the coalitions since its implementation in 1992.***
>
> ***H_a: The Florida Healthy Start program has not reduced the rate of low birthweight births within the target population in any of the coalitions since its implementation in 1992.***
>
> ***H_a: The Florida Healthy Start program has not reduced the rate of low birthweight births within the target population in some of the coalitions since its implementation in 1992.***

Dependent Variable

For purposes of this analysis, the dependent variable to be analyzed is the monthly low birthweight rate for nonwhite births in each of the ten coalitions between January 1988 and December 1996. The reasons nonwhite low birthweight births rates are being analyzed, rather than the rates for all births, has been addressed in previous sections.

Procedure

Raw data were obtained from birth records of all live births in Florida, tabulated by the Florida Office of Vital Statistics, and distributed by the College of Public Health at the University of South Florida. These raw data (total live births, total low birthweight births, total number of births to women 17 years of age or younger, and total births which began prenatal care in the first trimester) were provided for each county in the state of Florida by race and month from 1988 through 1996. These figures were aggregated into ten different datasets that represented the total number of births and low birthweight births for all the counties in the ten surveyed coalitions. Rates were calculated by examining the proportion of low birthweight births to total live births and then multiplied

by 1,000 in order to standardize the rates. It is standard to report these rates on a per 1,000 live birth proportion. These rates are standards that are reported within the medical and public health community, both nationally and internationally. The low birthweight rates for nonwhite women were analyzed for each coalition's dataset by using the ARIMA procedure previously discussed. The ARIMA models were calculated using the PROC ARIMA procedure in Statistical Application Software (SAS). For purposes of this study, the intervention date for the Healthy Start program was set in April 1992, the fifty-second observation of the time series. This is the date that most of the surveyed coalitions were recognized by state officials and funds began being distributed throughout the state.

Results of Substate ARIMA Analyses

This section examines the results of the ARIMA analyses of the impact of the Florida Healthy Start program in the ten coalitions surveyed in the second study. This section will examine the validity of the low birthweight birth rate datasets; look at the identification process; describe the estimation and diagnosis components; and describe the results of the intervention analysis.

Dataset Validity

Using the raw data reported on birth certificates to the Florida Office of Vital Statistics, low birthweight birth rates were calculated for nonwhite women on a county basis by month between January 1988 and December 1996 for each coalition dataset (see Appendix B for scattergrams of data for each coalition). Random manual calculations of the rates indicate that the calculated rates, SAS dates, and intervention variable accurately reflect the observed data. The purpose of examining the dataset in this fashion is to

ensure that the variables accurately represent the observations, especially the intervention variable. All ten datasets had high reliability with only one data error identified and corrected. Figure 23 provides the means for each of the ten data sets.

Coalition A

Variable	N	Mean	Std Dev	Minimum	Maximum
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
TOTNWB	108	202.9722222	28.6400342	122.0000000	290.0000000
NWLBWB	108	24.6296296	5.6627865	11.0000000	36.0000000
NWLBWR	108	122.2935390	27.4565446	58.8235294	180.7909605

Coalition B

Variable	N	Mean	Std Dev	Minimum	Maximum
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
TOTNWB	108	39.5833333	7.5345001	20.0000000	57.0000000
NWLBWB	108	4.2777778	2.3948283	0	10.0000000
NWLBWR	108	108.5332559	58.7930262	0	264.7058824

Coalition C

Variable	N	Mean	Std Dev	Minimum	Maximum
HRSID	108	10.0000000	0	10.0000000	10.0000000
COALID	108	5.0000000	0	5.0000000	5.0000000
COUNTYID	108	6.0000000	0	6.0000000	6.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	515.2592593	68.4007392	339.0000000	697.0000000
NWLBW	108	58.3518519	10.4428259	35.0000000	95.0000000
NWTEEN	108	41.8888889	7.7209913	22.0000000	64.0000000
NWTRI	108	324.9907407	76.5351908	162.0000000	517.0000000
WBIRTHS	108	1044.63	62.7234834	893.0000000	1179.00
WLBW	108	64.2314815	9.2621292	38.0000000	87.0000000
WTEEN	108	20.9907407	5.8044382	6.0000000	35.0000000
WTRI	108	917.0833333	77.2475236	728.0000000	1083.00
NWLBWR	108	113.8943870	18.0913504	73.9957717	168.2692308

Coalition D

Variable	N	Mean	Std Dev	Minimum	Maximum
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
TOTNWB	108	54.9444444	9.0871516	36.0000000	75.0000000
NWLBWB	108	6.0462963	2.4163936	0	12.0000000
NWLBWR	108	110.6017392	42.6391879	0	212.7659574

Figure 23 -- Means for surveyed coalition datasets

Coalition E

Variable	N	Mean	Std Dev	Minimum	Maximum
HRSID	108	1.0000000	0	1.0000000	1.0000000
COALID	108	10.0000000	0	10.0000000	10.0000000
COUNTYID	108	17.0000000	0	17.0000000	17.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	124.9629630	16.3295077	92.0000000	183.0000000
NWLBW	108	14.9259259	4.7334635	5.0000000	29.0000000
NWTEEN	108	12.9444444	3.8178952	4.0000000	27.0000000
NWTRI	108	78.1666667	11.8207010	54.0000000	107.0000000
WBIRTHS	108	225.7500000	24.2256236	177.0000000	291.0000000
WLBW	108	14.0462963	4.0657775	5.0000000	23.0000000
WTEEN	108	9.1296296	3.0142732	3.0000000	18.0000000
WTRI	108	192.1574074	16.5789880	156.0000000	237.0000000
NWLBWR	108	118.7887496	33.3128970	52.6315789	197.2789116

Coalition F

Variable	N	Mean	Std Dev	Minimum	Maximum
HRSID	108	15.0000000	0	15.0000000	15.0000000
COALID	108	19.0000000	0	19.0000000	19.0000000
COUNTYID	108	43.0000000	0	43.0000000	43.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	21.3240741	6.1139166	8.0000000	38.0000000
NWLBW	108	2.2592593	1.4232408	0	7.0000000
NWTEEN	108	2.2870370	1.7023948	0	8.0000000
NWTRI	108	8.6574074	3.6150310	2.0000000	19.0000000
WBIRTHS	108	78.4907407	9.7630769	55.0000000	98.0000000
WLBW	108	4.4166667	2.3685044	0	12.0000000
WTEEN	108	2.7592593	1.6053088	0	8.0000000
WTRI	108	64.0555556	8.5607596	44.0000000	85.0000000
NWLBWR	108	106.4757296	60.3162761	0	250.0000000

Coalition G

Variable	N	Mean	Std Dev	Minimum	Maximum
HRSID	108	11.0000000	0	11.0000000	11.0000000
COALID	108	20.0000000	0	20.0000000	20.0000000
COUNTYID	108	44.0000000	0	44.0000000	44.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	10.1666667	3.2968407	3.0000000	20.0000000
NWLBW	108	0.8796296	1.0827241	0	4.0000000
NWTEEN	108	0.7037037	0.8566317	0	4.0000000
NWTRI	108	6.4074074	2.8384445	1.0000000	15.0000000
WBIRTHS	108	68.5277778	9.7812125	46.0000000	95.0000000
WLBW	108	3.6666667	2.1660076	0	11.0000000
WTEEN	108	1.8611111	1.3973161	0	6.0000000
WTRI	108	61.1481481	9.0572580	42.0000000	92.0000000
NWLBWR	108	85.1555209	103.8451154	0	400.0000000

Figure 23 -- continued

Coalition H

Variable	N	Mean	Std Dev	Minimum	Maximum
HRSID	108	15.0000000	0	15.0000000	15.0000000
COALID	108	22.0000000	0	22.0000000	22.0000000
COUNTYID	108	47.0000000	0	47.0000000	47.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	5.2314815	2.2901923	1.0000000	11.0000000
NWLBW	108	0.6944444	0.8478487	0	4.0000000
NWTEEN	108	0.6388889	0.8696152	0	4.0000000
NWTRI	108	2.2962963	1.5240089	0	6.0000000
WBIRTHS	108	39.0277778	7.6506164	17.0000000	61.0000000
WLBW	108	2.8333333	1.7428090	0	8.0000000
WTEEN	108	3.2962963	1.6869995	0	7.0000000
WTRI	108	24.7962963	5.3942844	14.0000000	40.0000000
NWLBWR	108	125.6359895	156.9192049	0	666.6666667

Coalition I

Variable	N	Mean	Std Dev	Minimum	Maximum
HRS	108	5.0000000	0	5.0000000	5.0000000
COAL	108	26.0000000	0	26.0000000	26.0000000
COUNTY	108	51.0000000	0	51.0000000	51.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	14.5185185	4.3887739	7.0000000	25.0000000
NWLBW	108	1.5277778	1.3634641	0	7.0000000
NWTEEN	108	1.4166667	1.1448789	0	4.0000000
NWTRI	108	8.7500000	3.7594119	2.0000000	20.0000000
WBIRTHS	108	243.1574074	21.6730860	196.0000000	304.0000000
WLBW	108	15.6111111	4.3916517	6.0000000	29.0000000
WTEEN	108	11.8703704	4.1560509	4.0000000	29.0000000
WTRI	108	199.6574074	30.2108361	134.0000000	267.0000000
NWLBWR	108	104.0687887	91.5876913	0	437.5000000

Coalition J

Variable	N	Mean	Std Dev	Minimum	Maximum
HRSID	108	14.0000000	0	14.0000000	14.0000000
COALID	108	7.0000000	0	7.0000000	7.0000000
COUNTYID	108	58.0000000	0	58.0000000	58.0000000
MONTH	108	6.5000000	3.4681461	1.0000000	12.0000000
YEAR	108	92.0000000	2.5940262	88.0000000	96.0000000
NWBIRTHS	108	28.4074074	5.9531458	16.0000000	51.0000000
NWLBW	108	3.6388889	2.0573930	0	10.0000000
NWTEEN	108	3.5740741	2.0471257	0	11.0000000
NWTRI	108	16.6574074	4.2407944	7.0000000	28.0000000
WBIRTHS	108	189.7407407	16.8663633	155.0000000	226.0000000
WLBW	108	10.3518519	3.7123558	4.0000000	23.0000000
WTEEN	108	5.0092593	2.2360486	1.0000000	13.0000000
WTRI	108	161.1203704	15.4385835	125.0000000	200.0000000
NWLBWR	108	126.7193079	68.0231294	0	303.0303030

Figure 23 -- continued

ARIMA: Identification Process

As previously discussed, the ARIMA procedure requires the researcher to move through a four step process: identification, estimation, diagnosis, and intervention testing.

The *identification* process involves examining the ACF and PACF produced by the ARIMA procedure to look at the patterns of "spikes" and "decay" in the time series. This procedure was conducted on all ten datasets with similar results. All coalition data sets were stationary (see Appendix C).

ARIMA: Estimation and Diagnosis

The next step in the ARIMA process is the *estimation* of the time series. This is the process of fitting the most probable model suggested by the identification process. Based on the SAS printout for the datasets, the most likely models are seasonal autoregressive processes, the ARIMA $(1,0,0)(1,0,0)_{12}$. The models state that the process contains a seasonal autoregressive coefficient and an additional autoregressive coefficient. These estimates are incorporated into the PROC ARIMA procedure for each of the ten coalitions.

ARIMA: Intervention Component

The most crucial aspect of the ARIMA process is the attempt to identify the impact of an intervention on the ability to predict future observations. The "transfer function" in the Box-Jenkins ARIMA procedure is the intervention component. A transfer component may take one of three patterns: 1) an abrupt, constant change in the series; 2) a gradual, constant change in the series; or 3) an abrupt, temporary change in the series (Cook and Campbell, 1979). In the selection of which function is most appropriate, the researcher may have an a priori notion of the nature of the process. In the models estimated in this study, it is assumed that the change in the time series due to the implementation of the Healthy Start process will result in a gradual, constant change. In order to assess the fit of these models, the research must examine the significance of

the parameter estimates for the intervention component which is expressed in the NUM(1) and DENT (1,1) estimates in the conditional least squares estimations; examine the AIC and SBC components to find the model with the lowest values; check the correlations of the parameters and reject those that are highly correlated; and examine the autocorrelations of the residuals to ensure that they are not significant.

Analysis of all ten models indicates that the intervention variable has no significant predictive value in the previously modeled processes. The T-ratios for the intervention parameters on non-significant. This requires the research to remove the component from the models. As a result, all ten coalition models suggest that the implementation of the Healthy Start program has not had an impact on the rates of low birthweight births in the nonwhite population in Florida.

CHAPTER 5
DISCUSSION AND CONCLUSIONS

The ARIMA analyses and telephone survey conducted in this research indicates that the implementation of the state-sponsored Healthy Start program in Florida did not affect the low birthweight rates in nonwhite women between the years of 1992 and 1996. These findings have several implications for the research literature on policy innovation, policy implementation, and the medical literature. This chapter will summarize the findings of the three studies, will examine some of the possible reasons for the inability to find an impact by the program, and will discuss future research opportunities posed by the studies' findings.

Summary of Research Findings

This research examined the Florida Healthy Start program in order to determine if the program made a significant impact on its outcome objectives. The results of the ARIMA time-series analyses and the telephone survey indicate that this impact could not be determined at either the state or coalition level, apparently indicating that the program has not had an impact on low birthweight birth rates. These findings add to the public policy innovation/implementation and medical literature in several ways.

One positive contribution to the public policy implementation literature is the use of the ARIMA time-series analysis to link program outputs to outcomes. This weakness in the literature may be successfully addressed using this process. While most of the implementation literature utilizes regression analysis to look for causal relations between

the dependent and independent variables, the researchers may be "jumping the gun." Rather than looking at the impact of pieces of the program on its outcomes, the ARIMA process encourages the researchers to look at the program as a whole first. If the ARIMA process indicates that the program intervention has resulted in a change in the program's stated outcome objectives, then the researcher will have additional justification for examining the component pieces. This is also a procedure that encourages efficiency in the research process. Implementation data related to the policy process are often difficult to obtain. Time series data related to programs' outcome objectives are usually more easy to obtain and can provide supporting evidence for continued research.

The inability of this research to demonstrate that Florida's innovative approach to maternal and infant health care has been successful is not surprising given the recent findings in the medical literature cited earlier. While the characteristics of the Florida Healthy Start program were unique among the states (i.e., the inclusion of the actual medical services and the inclusion of the general population for eligibility), the underlying assumptions that determined which services would be provided and to whom were the same as those utilized in other states and at the federal level. Similar to the federal program and those in other states, the outputs did not impact the outcomes.

The medical literature strongly suggests that medical and psychosocial interventions attempting to reduce premature and low birthweight births have had little if any impact. Pooling many of these interventions together into one delivery system is still unable to impact systematic changes within high-risk populations. In addition, using the medical literature to identify the high-risk population eligible for Healthy Start services

One aspect of this study that has not been addressed in the medical literature is the seasonal pattern of low birthweight births rates. While the previous studies which examined this phenomena dealt with it as a methodological problem to be controlled for in the analysis (Miller, et al., 1990; Clarke et al., 1993; Joyce, 1990), the fact remains that for every year between 1988 and 1996, nonwhite women in Florida who give birth during the winter of each year (December-February) are less likely to have a poor birth outcome than those nonwhite women who give birth in the summer. The public health implications of understanding this phenomena are substantial. If the conditions could be created which produce the significantly lower low birthweight birth rates in the winter could be reproduced in the summer, an overall substantial decrease in the annual low birthweight birth rates would result. In raw numbers, this would result in fewer low birrthweight births and fewer infant deaths resulting from the complications related to the poor birth outcome.

Possible Reasons for Policy Failure

Based on the policy implementation literature there may be many reasons why this research was unable to determine whether the Healthy Start program had an impact on the low birthweight rates in the nonwhite population in Florida. This section will look at some of the possibilities including: implementation factors; tractability of the problem itself; and the policy theory on which the program is based.

Implementation Factors

As previously discussed, the research literature list a multitude of factors that may help or hinder a program from being successfully implemented. Leadership styles, decision-making processes, communication processes, individual attributes, and a host of

other factors have all been identified as possible variables that may impact the success or failure of public programs. In this research, several of the factors discussed earlier were examined through the telephone survey of decision-makers in the coalitions. By most accounts, many of the factors that have been identified as helping a program succeed were present in the coalitions offering Healthy Start services. While there were minor variations within coalitions, they were not significant enough to drive the program towards proven success. When weighed against the literature, it appears that the coalitions are "doing it right." One may conclude then that either something else was affecting the outcomes, or that the implementation literature is not supported. Either way, it is necessary to look elsewhere for an explanation of the studies' findings.

Tractability and Policy Theory

One of the implementation factors that needs additional attention is the issue of tractability. As previously discussed, a policy is often created to solve a problem. Depending on what type of problem the policy is trying to solve (social, economic, environmental, etc.), the chances of implementation success or failure can be surmised. Some problems are simply more difficult to solve than other problems. Hazardous or nuclear waste is simply more difficult to manage than solid waste. This is especially true of the problems that come into the public sector for solutions. These problems have often been delegated into the public sector because of market failure in the private sector, yet they are problems that must be managed. Under this concept one can conclude that to the extent the problem has valid technical solutions, technologically accurate instruments of measurement, specific types and amounts of behaviors to alter, an identifiable and

geographically concentrated population to target, the problem has a higher or lower degree of tractability that will help or hinder implementation.

On its face, the Healthy Start program seems to have every element for a high degree of program tractability. Solutions to address the problem are based on readily available technology, are easily measurable, and have a method for identifying a concentrated target population. But is this really the case? According to the medical literature previously discussed, the services being provided are coming under increasing scrutiny for their failure to mitigate the paradox of more resources yet increasingly high levels of poor birth outcomes. Additionally, the screening tool used to target the Healthy Start population is notorious for producing both false positives and false negatives.

With this in mind, the author proposes that the inability of finding an impact of the Healthy Start program in Florida may be the result of a bad policy theory, that is only coming to light with the recent arguments being proposed in the medical literature. Specifically, every aspect of the Healthy Start program is based on a core group of studies that suggest that it is known what causes poor birth outcomes and how they can be alleviated. The screening tool selects risk factors from this literature and the service providers use intervention protocol based on this same literature. But what if the medical literature is wrong? If the argument proposed by Goldenberg and Rouse (1998), is accurate, that the interventions are based primarily on correlative studies which are seldom supported in controlled experiments, than the entire Healthy Start program is based on inaccurate policy theory. While it is possible that the program may be helping some individuals, it would seem unlikely that the population as a whole will ever see a significant impact resulting from the program's implementation. What does this mean

for the public administrator trying to prioritize between various health programs? Simply that this research brings in to question the program's efficacy and that additional research should be focused on interventions with a more sound, empirical basis.

Additional Areas of Possible Research

Additional research in the area of public health programs addressing poor birth outcomes may compare the impact of Florida's maternal and infant care programs to that of other states' programs. Other research may also, and should, be conducted on the cause behind the seasonal pattern of low birthweight births in nonwhite women in Florida and among the coalitions. The result of such research may be the first successful policy interventions related to reducing poor birth outcomes in Florida's population, and ultimately, saving infants' lives. If this were to occur, the state would have healthy policy helping to foster healthy babies.

APPENDIX A
HEALTHY START EXPERT SURVEY

Date	________________	*Coalition ID*	________________
Time	________________	*Contact Person*	________________
Phone	________________		

[At call answer, request to speak with executive/program director of Healthy Start.]

Hello, my name is Michael Garner and I am a doctoral student at the University of Florida. I'm conducting research on the implementation of the federal and state Healthy Start programs in Florida. I am contacting executive directors of the Healthy Start Coalitions to understand the unique ways that the program is being administered among the coalitions. This is not a sales call and you may refuse to answer any questions at any time.

Although you will not be identified directly in the research analysis and your responses will be held in confidence, descriptive information about your coalition and the counties included in your service area (such as the number of counties in the coalition, whether it is rural or urban, whether it is a federal or state Healthy Start program) may provide enough information to persons familiar with the program to identify you as the survey respondent.

The survey should take about thirty minutes. Are you willing to participate in this study?

[If ***YES***, go to question #1.]
[If ***NO***, ask, "Is there another time which would be better to contact you?"
If ***Yes***, indicate the date and time to call back here ________________ .
If ***No***, say, "Thank you very much for your time." Circle the NO response in this sentence and DO NOT CONTACT again.]

<u>Coalition Description</u>

1) I would like to begin by asking you a few questions about your coalition. In what year was your Healthy Start coalition incorporated? ______________________

2) How many counties are included in your coalition? ______________________

3) Would you describe the county/counties in your coalition as 1) mostly rural, 2) both rural and urban, or 3) mostly urban? ____________________

____

Board of Directors Description and Activity

4) I would now like to ask you some questions about the composition of your Healthy Start Board of Directors. How many persons are on your Healthy Start Coalition Board of Directors, both in total number of positions available and total number currently occupied? ***Available?*** ________ ***Occupied?*** ________

5) As an estimate, what percent of Board positions become vacant in any given year?

____

6) As an estimate, what percent of the current Board members represent the public health care system (such as county public health units, Florida Department of Health, etc.)?

____

____

7) Do your coalition's bylaws expressly limit the number or percent of Board seats that can be held by persons from the public sector? If so, how? ____________

____

____

8) Do your coalition's bylaws have term limitations for members of your Board of Directors? If so, what are the requirements? ____________________

____

____

9) Which of the following issues are most frequently addressed by the coalition's Board of Directors? ***(Circle the appropriate response. They may only chose one.)***

a) **Budgetary request and allocations** (how and how much of the budget will be spent within the coalition, etc.)
b) **Service delivery issues** (which services will be emphasized, best practices for delivery of services, etc.)
c) **Program development** (significant changes that should be incorporated into the program at the state level, etc.)
d) **Coalition activity** (how the Board is structured, how decisions are made, etc.)
e) **Other. Please describe.** ____________________

____

10) Which of the following best describes how decisions are made by the Board of Directors? ***(Circle the appropriate response. They may only chose one.)***

a) Casual discussion of issue, short deliberation, significant deference to staff recommendations, a couple of standing issue committees, consensus voting, and most issues addressed at only one meeting to make a decision or set a policy.
b) Slightly formal discussion of issue, fairly long discussions, some questioning of staff recommendations, some standing and some ad hoc issue committees, a mix of consensus and counted votes, and some issues may be addressed in two or more meetings.
c) Formal presentation and discussion of issue, lengthy discussion, considerable analysis and questioning of staff work, multiple committees, mostly counted votes, and most issues take more than one meeting to arrive at a decision or set a policy.

11) What is the most significant cause of conflict in the decision-making process of the Board? Why?

____

____

____

____

12) To what extent are Board members directly involved in day-to-day program administration with staff? ______________________

____

Staff Composition and Professionalism

13) For how long have you been the executive/program director of this coalition? ______

____

____

14) What is your educational and professional background? Degrees, years of experience, etc.? ______________________________

____

____

15) Excluding yourself, how many full-time employees (FTEs) serve as support staff for the Board of Directors? ______________________

____

____

16) Of the full-time staff that you noted in the last question, what is their educational and professional backgrounds? ______________________________

____

____

Health Start Population

17) I would now like to ask you a few questions about your coalition's Healthy Start population, the actual people who are eligible and receive services. What are the current prenatal and infant Healthy Start enrollment numbers for your coalition?
Prenatal __________ ***Infant*** __________

18) What are the most common risk factors associated with your Healthy Start enrollees? Why are most eligible? ______________________________

____

____

19) Do you believe that your Healthy Start population is at greater risk for poor birth outcomes than those in other coalitions? If so, why?____________________

____

____

____

____

20) How do most Healthy Start eligible people obtain information about the program?

____

____

____

21) How do you believe the Healthy Start program is viewed in your service area? Do enrollees consider it a public or private health program? ____________

____

Healthy Start Services

22) I would now like to ask some questions about the actual services delivered to Healthy Start enrollees. Would you please indicate which of the following services are consistently provided in your coalition?

(Read each service and then circle 'Yes' or 'No.')

Does your coalition provide:

a. Healthy Start prenatal screening	**Yes**	**No**
b. Healthy Start infant screening	**Yes**	**No**

c. Prenatal medical care	Yes	No
d. Post partum medical care	Yes	No
e. Care coordination	Yes	No
f. Outreach and case finding	Yes	No
g. Information and referral	Yes	No
h. Comprehensive assessment of service needs	Yes	No
i. Psychosocial counseling	Yes	No
j. Nutritional counseling (excluding WIC)	Yes	No
k. Smoking cessation counseling (information only)	Yes	No
l. Smoking cessation counseling (classes)	Yes	No
m. Alcohol cessation counseling (information only)	Yes	No
n. Alcohol cessation counseling (classes)	Yes	No
o. Illicit drug cessation counseling (information only)	Yes	No
p. Illicit drug cessation counseling (classes)	Yes	No
q. Childbirth education and support	Yes	No
r. Breastfeeding education and support	Yes	No
s. Parenting education and support	Yes	No
t. Home visitation	Yes	No
u. Transportation	Yes	No

23) Are there other services offered throughout your coalition not identified in the previous list? ____
____
____

24) Are Healthy Start services provided in the same manner throughout the coalition (for instance, among counties and providers)?______________________________
____
____

25) In your opinion, of all Healthy Start services offered in your coalition area, what have been the most beneficial services for the target population? ______________
____
____
____
____

26) In your opinion, what has been the greatest barrier to providing Healthy Start services in your coalition area? ______________________________
____
____
____

27) In your opinion, is there a need for additional resources in the Healthy Start program and if so, is there a particular service that would benefit from these increased resources? ______

Service Providers Descriptions

28) Are the primary providers of Healthy Start services in your coalition in the public or private health care system? ______

29) Has there been a significant change in the type of service provider or location of service provision since the beginning of the coalition? If so, when and why? ______

30) How are coalition policies and decisions communicated to the actual service providers? ______

31) How does the coalition monitor and evaluate the delivery of Health Start services by these providers? ______

32) If you have had experience with both private and public providers of Healthy Start services, would you consider one group better than the other? Why? ______

33) Have there been any significant problems with providers, public or private? How were they identified? ______

34) What types of sanctions are available to the coalition if a provider is determined to be not meeting expected performance levels? ________________

____

____

35) Of the possible sanctions available to the coalition, which ones have been used against a provider and what was the outcome? ________________

____

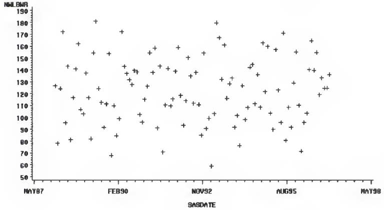
____

____

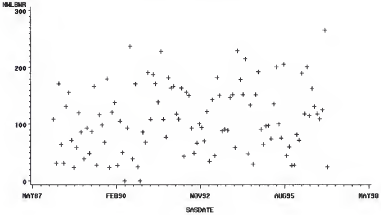
This concludes this survey. I would like to thank you very much for your assistance. If you have any questions about the research at a later date, please contact me at 904.905.8383.

APPENDIX B
SUBSTATE SCATTERGRAMS

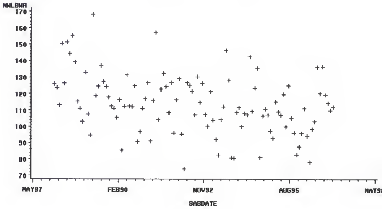
Coalition A: Scattergram



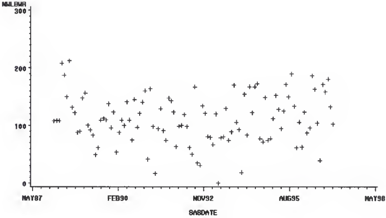
Coalition B: Scattergram



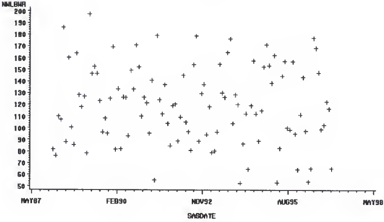
Coalition C: Scattergram



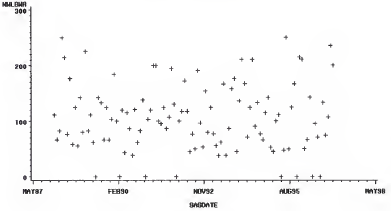
Coalition D: Scattergram



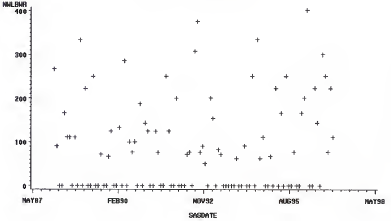
Coalition E: Scattergram



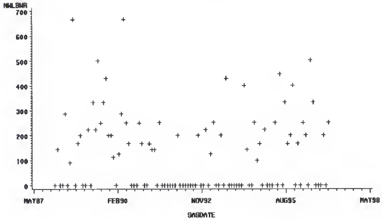
Coalition F: Scattergram



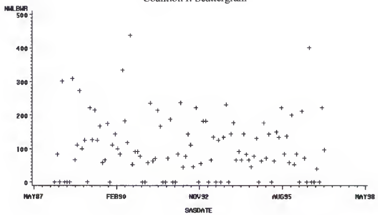
Coalition G: Scattergram



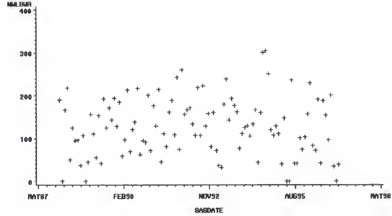
Coalition H: Scattergram



Coalition I: Scattergram



Coalition J: Scattergram



APPENDIX C
SUBSTATE ARIMA ANALYSES

Coalition A

```
                        ARIMA Procedure

              Name of variable = NWLBWR.

              Mean of working series = 122.2935
              Standard deviation     = 27.32914
              Number of observations =      108

                        Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1      Std
  0    746.882     1.00000   |                    |********************|       0
  1  26.835705     0.03593   |                .   |*  .                | 0.096225
  2 -51.433935    -0.06886   |                .  *|   .                | 0.096349
  3 -75.817342    -0.10151   |                . **|   .                | 0.096804
  4   -123.946    -0.16595   |                .***|   .                | 0.097785
  5  22.333802     0.02990   |                .   |*  .                | 0.100358
  6 -40.198611    -0.05382   |                .  *|   .                | 0.100441
  7   -113.737    -0.15228   |                .***|   .                | 0.100708
  8 -29.460318    -0.03944   |                .  *|   .                | 0.102818
  9   -141.256    -0.18913   |                ****|   .                | 0.102958
 10  44.885198     0.06010   |                .   |*  .                | 0.106126
 11  84.157922     0.11268   |                .   |** .                | 0.106440
 12  14.532947     0.01946   |                .   |   .                | 0.107539
 13  61.811777     0.08276   |                .   |** .                | 0.107572
 14 -66.889179    -0.08956   |                . **|   .                | 0.108160
 15 -55.856543    -0.07479   |                .  *|   .                | 0.108844
 16   2.762282     0.00370   |                .   |   .                | 0.109319
 17  10.262659     0.01374   |                .   |   .                | 0.109320
 18    127.630     0.17088   |                .   |***.                | 0.109336
 19 -22.905115    -0.03067   |                .  *|   .                | 0.111782
 20 -12.803252    -0.01714   |                .   |   .                | 0.111859
 21  42.449456     0.05684   |                .   |*  .                | 0.111884
 22 -89.036141    -0.11921   |                . **|   .                | 0.112151
 23  94.575559     0.12663   |               .    |***  .              | 0.113318
 24 -47.668700    -0.06382   |               .   *|    .               | 0.114621
                                  "." marks two standard errors
```

Inverse Autocorrelations

```
Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.34859 |                .   |*******             |
  2     0.44283 |                .   |*********           |
  3     0.42676 |                .   |*********           |
  4     0.39669 |                .   |********            |
  5     0.37510 |                .   |********            |
  6     0.36419 |                .   |*******             |
  7     0.42421 |                .   |********            |
  8     0.31505 |                .   |******              |
  9     0.35495 |                .   |*******             |
 10     0.25332 |                .   |*****               |
 11     0.17129 |                .   |***.                |
 12     0.22497 |                .   |****                |
 13     0.17776 |                .   |****                |
 14     0.16194 |                .   |***.                |
 15     0.20142 |                .   |****                |
 16     0.12633 |                .   |***.                |
 17     0.10125 |                .   |** .                |
 18     0.02301 |                .   |   .                |
 19     0.08383 |                .   |** .                |
 20     0.04478 |                .   |*  .                |
 21     0.01103 |                .   |   .                |
 22     0.10725 |                .   |** .                |
 23    -0.03736 |                .  *|   .                |
 24     0.06965 |                .   |*  .                |
```

Partial Autocorrelations

```
Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.03593 |                .   |*  .                |
  2    -0.07025 |                .  *|   .                |
  3    -0.09694 |                . **|   .                |
  4    -0.16643 |                .***|   .                |
  5     0.02535 |                .   |*  .                |
  6    -0.09242 |                . **|   .                |
  7    -0.18673 |                ****|   .                |
  8    -0.07607 |                . **|   .                |
  9    -0.24618 |               *****|   .                |
 10    -0.02619 |                .  *|   .                |
 11    -0.01005 |                .   |   .                |
 12    -0.06543 |                .  *|   .                |
 13    -0.01055 |                .   |   .                |
 14    -0.13182 |                .***|   .                |
 15    -0.13325 |                .***|   .                |
 16    -0.12058 |                . **|   .                |
 17    -0.05480 |                .  *|   .                |
 18     0.07346 |                .   |*  .                |
 19    -0.07954 |                . **|   .                |
 20     0.00181 |                .   |   .                |
 21     0.02199 |                .   |   .                |
 22    -0.14685 |                .***|   .                |
 23     0.07493 |                .   |*  .                |
 24    -0.11803 |                . **|   .                |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	5.43	6	0.490	0.036	-0.069	-0.102	-0.166	0.030	-0.054
12	14.67	12	0.260	-0.152	-0.039	-0.189	0.060	0.113	0.019
18	21.14	18	0.273	0.083	-0.090	-0.075	0.004	0.014	0.171
24	26.52	24	0.327	-0.031	-0.017	0.057	-0.119	0.127	-0.064

Coalition B

```
                             ARIMA Procedure

                   Name of variable = NWLBWR.

                   Mean of working series = 108.5333
                   Standard deviation     =  58.5202
                   Number of observations =      108

                            Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1          Std
  0   3424.614     1.00000  |                   |********************|           0
  1   -105.925    -0.03093  |               .  *|   .                |    0.096225
  2    371.274     0.10841  |               .   |** .                |    0.096317
  3    471.319     0.13763  |               .   |***.                |    0.097440
  4   -349.031    -0.10192  |               . **|   .                |    0.099224
  5    440.824     0.12872  |               .   |***.                |    0.100189
  6   -236.109    -0.06894  |               .  *|   .                |    0.101708
  7    358.377     0.10465  |               .   |** .                |    0.102140
  8    162.590     0.04748  |               .   |*  .                |    0.103128
  9   -204.705    -0.05977  |               .  *|   .                |    0.103330
 10    177.399     0.05180  |               .   |*  .                |    0.103650
 11    127.064     0.03710  |               .   |*  .                |    0.103889
 12   -415.705    -0.12139  |               . **|   .                |    0.104012
 13   -193.467    -0.05649  |               .  *|   .                |    0.105316
 14   -362.928    -0.10598  |               . **|   .                |    0.105596
 15  67.127618     0.01960  |               .   |   .                |    0.106576
 16    147.557     0.04309  |               .   |*  .                |    0.106609
 17   -261.469    -0.07635  |               . **|   .                |    0.106771
 18   -167.755    -0.04899  |               .  *|   .                |    0.107275
 19   -215.992    -0.06307  |               .  *|   .                |    0.107482
 20   -173.463    -0.05065  |               .  *|   .                |    0.107824
 21   -296.687    -0.08663  |               . **|   .                |    0.108044
 22    171.032     0.04994  |               .   |*  .                |    0.108685
 23  40.374913     0.01179  |               .   |   .                |    0.108898
 24  91.220818     0.02664  |               .   |*  .                |    0.108909
                                       "." marks two standard errors


                         Inverse Autocorrelations

           Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
             1     0.00258  |               .   |   .                |
             2    -0.12122  |               . **|   .                |
             3    -0.17342  |               .***|   .                |
             4     0.14248  |               .   |***.                |
             5    -0.04706  |               .  *|   .                |
             6     0.04177  |               .   |*  .                |
             7    -0.15311  |               .***|   .                |
             8     0.06113  |               .   |*  .                |
             9     0.04980  |               .   |*  .                |
            10    -0.07035  |               .  *|   .                |
            11    -0.14301  |               .***|   .                |
            12     0.10632  |               .   |** .                |
            13     0.11426  |               .   |** .                |
            14     0.08245  |               .   |** .                |
            15    -0.07964  |               . **|   .                |
            16    -0.08753  |               . **|   .                |
            17     0.06761  |               .   |*  .                |
            18     0.07545  |               .   |** .                |
            19     0.01747  |               .   |   .                |
            20     0.00874  |               .   |   .                |
            21     0.07745  |               .   |** .                |
            22    -0.04141  |               .  *|   .                |
            23    -0.03430  |               .  *|   .                |
            24    -0.04618  |               .  *|   .                |
```

Partial Autocorrelations

```
Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1   -0.03093   |               .  *|   .               |
  2    0.10756   |               .   |** .               |
  3    0.14577   |               .   |***.               |
  4   -0.10714   |               . **|   .               |
  5    0.09450   |               .   |** .               |
  6   -0.06233   |               .  *|   .               |
  7    0.11228   |               .   |** .               |
  8    0.02425   |               .   |   .               |
  9   -0.04274   |               .  *|   .               |
 10   -0.01177   |               .   |   .               |
 11    0.07889   |               .   |** .               |
 12   -0.14012   |               .***|   .               |
 13   -0.08510   |               . **|   .               |
 14   -0.09972   |               . **|   .               |
 15    0.06932   |               .   |*  .               |
 16    0.06369   |               .   |*  .               |
 17   -0.04425   |               .  *|   .               |
 18   -0.12886   |               .***|   .               |
 19   -0.02075   |               .   |   .               |
 20    0.00460   |               .   |   .               |
 21   -0.06726   |               .  *|   .               |
 22    0.06061   |               .   |*  .               |
 23    0.03878   |               .   |*  .               |
 24    0.05475   |               .   |*  .               |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	7.22	6	0.301	-0.031	0.108	0.138	-0.102	0.129	-0.069
12	11.52	12	0.485	0.105	0.047	-0.060	0.052	0.037	-0.121
18	14.70	18	0.682	-0.056	-0.106	0.020	0.043	-0.076	-0.049
24	17.07	24	0.846	-0.063	-0.051	-0.087	0.050	0.012	0.027

Coalition C

```
                                ARIMA Procedure

                    Name of variable = NWLBWR.

                    Mean of working series = 113.8944
                    Standard deviation     =  18.0074
                    Number of observations =      108

                                Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1           Std
  0    324.266     1.00000 |                   |********************|            0
  1  86.829925     0.26777 |               .   |*****               |     0.096225
  2  36.726566     0.11326 |               .   |** .                |     0.102894
  3  67.612695     0.20851 |               .   |****                |     0.104042
  4  30.372774     0.09367 |               .   |** .                |     0.107841
  5  22.652710     0.06986 |               .   |*  .                |     0.108592
  6   4.453242     0.01373 |               .   |   .                |     0.109007
  7  -9.160364    -0.02825 |               .  *|   .                |     0.109023
  8   1.791547     0.00552 |               .   |   .                |     0.109091
  9  25.847083     0.07971 |               .   |** .                |     0.109094
 10  40.911330     0.12617 |               .   |***.                |     0.109632
 11  21.199416     0.06538 |               .   |*  .                |     0.110968
 12  59.912342     0.18476 |               .   |****                |     0.111324
 13  49.466490     0.15255 |              .    |*** .               |     0.114128
 14  29.371583     0.09058 |              .    |**  .               |     0.116001
 15  29.505397     0.09099 |              .    |**  .               |     0.116654
 16   0.967807     0.00298 |              .    |    .               |     0.117309
 17 -28.522745    -0.08796 |              .  **|    .               |     0.117310
 18   6.065738     0.01871 |              .    |    .               |     0.117919
 19  -3.446991    -0.01063 |              .    |    .               |     0.117946
 20  -7.530186    -0.02322 |              .    |    .               |     0.117955
 21   9.565199     0.02950 |              .    |*   .               |     0.117997
 22 -13.970178    -0.04308 |              .   *|    .               |     0.118066
 23  18.976089     0.05852 |              .    |*   .               |     0.118211
 24  52.448641     0.16175 |              .    |*** .               |     0.118479
                                   "." marks two standard errors


                            Inverse Autocorrelations

            Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
              1    -0.20466 |               ****|   .                |
              2     0.05131 |               .   |*  .                |
              3    -0.16480 |               .***|   .                |
              4    -0.02746 |               .  *|   .                |
              5    -0.05401 |               .  *|   .                |
              6     0.04508 |               .   |*  .                |
              7     0.02720 |               .   |*  .                |
              8     0.01494 |               .   |   .                |
              9     0.03007 |               .   |*  .                |
             10    -0.10044 |               . **|   .                |
             11     0.08813 |               .   |** .                |
             12    -0.12900 |               .***|   .                |
             13    -0.03194 |               .  *|   .                |
             14    -0.02974 |               .  *|   .                |
             15     0.01551 |               .   |   .                |
             16     0.00943 |               .   |   .                |
             17     0.10390 |               .   |** .                |
             18    -0.04569 |               .  *|   .                |
             19    -0.01250 |               .   |   .                |
             20     0.01210 |               .   |   .                |
             21    -0.03453 |               .  *|   .                |
             22     0.09898 |               .   |** .                |
             23    -0.01513 |               .   |   .                |
             24    -0.08047 |               . **|   .                |
```

```
                        Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.26777 |                .   |*****               |
  2     0.04477 |                .   |*  .                |
  3     0.18086 |                .   |****                |
  4    -0.00696 |                .   |   .                |
  5     0.03129 |                .   |*  .                |
  6    -0.05338 |                .  *|   .                |
  7    -0.04117 |                .  *|   .                |
  8     0.00739 |                .   |   .                |
  9     0.09414 |                .   |** .                |
 10     0.11345 |                .   |** .                |
 11     0.01070 |                .   |   .                |
 12     0.15187 |                .   |***.                |
 13     0.02648 |                .   |*  .                |
 14     0.01205 |                .   |   .                |
 15    -0.00663 |                .   |   .                |
 16    -0.06242 |                .  *|   .                |
 17    -0.11636 |                . **|   .                |
 18     0.05564 |                .   |*  .                |
 19    -0.00709 |                .   |   .                |
 20     0.02477 |                .   |   .                |
 21     0.02812 |                .   |*  .                |
 22    -0.09513 |                . **|   .                |
 23     0.06218 |                .   |*  .                |
 24     0.09457 |                .   |** .                |


                Autocorrelation Check for White Noise

 To    Chi                       Autocorrelations
Lag  Square DF   Prob
  6   15.90  6  0.014  0.268  0.113  0.209  0.094  0.070  0.014
 12   23.44 12  0.024 -0.028  0.006  0.080  0.126  0.065  0.185
 18   29.50 18  0.043  0.153  0.091  0.091  0.003 -0.088  0.019
 24   34.15 24  0.082 -0.011 -0.023  0.029 -0.043  0.059  0.162
```

Coalition D

ARIMA Procedure

```
Name of variable = NWLBWR.

Mean of working series = 110.6017
Standard deviation     = 42.44133
Number of observations =      108

                          Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1      Std
  0   1801.266     1.00000 |                   |********************|        0
  1    291.985     0.16210 |               .   |***.                | 0.096225
  2  43.403985     0.02410 |               .   |   .                | 0.098721
  3    131.135     0.07280 |               .   |*  .                | 0.098776
  4    182.674     0.10141 |               .   |** .                | 0.099271
  5 -88.877453    -0.04934 |               .  *|   .                | 0.100226
  6   -132.828    -0.07374 |               .  *|   .                | 0.100451
  7    142.358     0.07903 |               .   |** .                | 0.100951
  8    303.130     0.16829 |               .   |***.                | 0.101522
  9    180.710     0.10032 |               .   |** .                | 0.104073
 10   -146.960    -0.08159 |               . **|   .                | 0.104964
 11 -63.934588    -0.03549 |               .  *|   .                | 0.105550
 12  22.524590     0.01250 |               .   |   .                | 0.105660
 13  20.818350     0.01156 |               .   |   .                | 0.105674
 14  71.334619     0.03960 |               .   |*  .                | 0.105686
 15    148.885     0.08266 |               .   |** .                | 0.105823
 16    250.608     0.13913 |               .   |***.                | 0.106419
 17   3.628153     0.00201 |               .   |   .                | 0.108090
 18   -361.620    -0.20076 |               ****|   .                | 0.108091
 19  11.795776     0.00655 |               .   |   .                | 0.111490
 20 -27.837628    -0.01545 |               .   |   .                | 0.111493
 21   -102.092    -0.05668 |               .  *|   .                | 0.111513
 22 -70.913530    -0.03937 |               .  *|   .                | 0.111779
 23    232.550     0.12910 |               .   |***.                | 0.111908
 24  25.109853     0.01394 |              .    |    .               | 0.113279
                                  "." marks two standard errors


                      Inverse Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1    -0.08216 |               . **|   .                |
  2    -0.08755 |               . **|   .                |
  3    -0.15687 |               .***|   .                |
  4    -0.10907 |               . **|   .                |
  5     0.09735 |               .   |** .                |
  6     0.16949 |               .   |***.                |
  7     0.01635 |               .   |   .                |
  8    -0.11673 |               . **|   .                |
  9    -0.18304 |               ****|   .                |
 10     0.03628 |               .   |*  .                |
 11     0.07191 |               .   |*  .                |
 12     0.09836 |               .   |** .                |
 13    -0.00042 |               .   |   .                |
 14    -0.10446 |               . **|   .                |
 15    -0.06178 |               .  *|   .                |
 16    -0.06231 |               .  *|   .                |
 17     0.01116 |               .   |   .                |
 18     0.19545 |               .   |****                |
 19    -0.06089 |               .  *|   .                |
 20    -0.00730 |               .   |   .                |
 21    -0.00792 |               .   |   .                |
 22     0.02946 |               .   |*  .                |
 23    -0.06201 |               .  *|   .                |
 24     0.05794 |               .   |*  .                |
```

```
                         Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.16210  |               .   |***.               |
  2    -0.00224  |               .   |   .               |
  3     0.07112  |               .   |*  .               |
  4     0.08090  |               .   |** .               |
  5    -0.08191  |               . **|   .               |
  6    -0.06066  |               .  *|   .               |
  7     0.09372  |               .   |** .               |
  8     0.14951  |               .   |***.               |
  9     0.07560  |               .   |** .               |
 10    -0.12343  |               . **|   .               |
 11    -0.06120  |               .  *|   .               |
 12    -0.00397  |               .   |   .               |
 13     0.05227  |               .   |*  .               |
 14     0.09825  |               .   |** .               |
 15     0.05196  |               .   |*  .               |
 16     0.05379  |               .   |*  .               |
 17    -0.07771  |               . **|   .               |
 18    -0.21684  |               ****|   .               |
 19     0.09444  |               .   |** .               |
 20     0.00520  |               .   |   .               |
 21    -0.00690  |               .   |   .               |
 22    -0.02657  |               .  *|   .               |
 23     0.05590  |               .   |*  .               |
 24    -0.07043  |               .  *|   .               |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	5.67	6	0.461	0.162	0.024	0.073	0.101	-0.049	-0.074
12	11.96	12	0.449	0.079	0.168	0.100	-0.082	-0.035	0.013
18	20.87	18	0.286	0.012	0.040	0.083	0.139	0.002	-0.201
24	23.91	24	0.467	0.007	-0.015	-0.057	-0.039	0.129	0.014

Coalition E

```
                         ARIMA Procedure

           Name of variable = NWLBWR.

           Mean of working series = 118.7887
           Standard deviation     = 33.15831
           Number of observations =      108

                        Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1        Std
  0   1099.474     1.00000 |                   |********************|         0
  1  58.883840     0.05356 |               .   |*  .                |  0.096225
  2   -112.871    -0.10266 |               . **|   .                |  0.096501
  3 -13.297339    -0.01209 |               .   |   .                |  0.097507
  4 -90.431751    -0.08225 |               . **|   .                |  0.097521
  5 -32.227904    -0.02931 |               .  *|   .                |  0.098161
  6   -190.834    -0.17357 |               .***|   .                |  0.098242
  7 -88.174118    -0.08020 |               . **|   .                |  0.101041
  8  93.937799     0.08544 |               .   |** .                |  0.101629
  9   -117.771    -0.10712 |               . **|   .                |  0.102292
 10 -10.384424    -0.00944 |               .   |   .                |  0.103325
 11  12.355799     0.01124 |               .   |   .                |  0.103333
 12  20.876403     0.01899 |               .   |   .                |  0.103344
 13    110.964     0.10092 |               .   |** .                |  0.103377
 14 -12.159766    -0.01106 |               .   |   .                |  0.104285
 15 -71.386831    -0.06493 |               .  *|   .                |  0.104296
 16 -61.732511    -0.05615 |               .  *|   .                |  0.104670
 17  48.155637     0.04380 |               .   |*  .                |  0.104948
 18  78.700953     0.07158 |               .   |*  .                |  0.105117
 19  77.417484     0.07041 |               .   |*  .                |  0.105568
 20 -69.409498    -0.06313 |               .  *|   .                |  0.106002
 21 -11.329458    -0.01030 |               .   |   .                |  0.106349
 22 -90.066927    -0.08192 |               . **|   .                |  0.106358
 23  -3.550116    -0.00323 |               .   |   .                |  0.106941
 24    172.449     0.15685 |               .   |***.                |  0.106942
                                    "." marks two standard errors


                      Inverse Autocorrelations

           Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
             1    -0.00510 |               .   |   .                |
             2     0.12500 |               .   |** .                |
             3    -0.00123 |               .   |   .                |
             4     0.11026 |               .   |** .                |
             5     0.11709 |               .   |** .                |
             6     0.20031 |               .   |****                |
             7     0.11795 |               .   |** .                |
             8    -0.10016 |               . **|   .                |
             9     0.13379 |               .   |***.                |
            10     0.02983 |               .   |*  .                |
            11     0.06889 |               .   |*  .                |
            12    -0.00874 |               .   |   .                |
            13    -0.06046 |               .  *|   .                |
            14     0.00749 |               .   |   .                |
            15     0.01840 |               .   |   .                |
            16     0.12466 |               .   |** .                |
            17    -0.09766 |               . **|   .                |
            18    -0.05717 |               .  *|   .                |
            19    -0.10472 |               . **|   .                |
            20     0.04979 |               .   |*  .                |
            21    -0.00112 |               .   |   .                |
            22     0.05258 |               .   |*  .                |
            23    -0.02423 |               .   |   .                |
            24    -0.14351 |               .***|   .                |
```

```
                         Partial Autocorrelations

 Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
   1    0.05356   |                .   |*  .                |
   2   -0.10583   |                . **|   .                |
   3   -0.00035   |                .   |   .                |
   4   -0.09369   |                . **|   .                |
   5   -0.02077   |                .   |   .                |
   6   -0.19424   |                ****|   .                |
   7   -0.07083   |                .  *|   .                |
   8    0.04248   |                .   |*  .                |
   9   -0.14811   |                .***|   .                |
  10   -0.02084   |                .   |   .                |
  11   -0.04613   |                .  *|   .                |
  12   -0.01409   |                .   |   .                |
  13    0.04886   |                .   |*  .                |
  14   -0.01398   |                .   |   .                |
  15   -0.08997   |                . **|   .                |
  16   -0.08781   |                . **|   .                |
  17    0.06081   |                .   |*  .                |
  18    0.03615   |                .   |*  .                |
  19    0.09473   |                .   |** .                |
  20   -0.07612   |                . **|   .                |
  21   -0.01602   |                .   |   .                |
  22   -0.10492   |                . **|   .                |
  23    0.04346   |                .   |*  .                |
  24    0.17317   |                .   |***.                |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	5.90	6	0.435	0.054	-0.103	-0.012	-0.082	-0.029	-0.174
12	8.97	12	0.706	-0.080	0.085	-0.107	-0.009	0.011	0.019
18	12.13	18	0.840	0.101	-0.011	-0.065	-0.056	0.044	0.072
24	17.75	24	0.815	0.070	-0.063	-0.010	-0.082	-0.003	0.157

Coalition F

```
                              ARIMA Procedure


                         Name of variable = NWLBWR.

                         Mean of working series = 106.4757
                         Standard deviation     = 60.03638
                         Number of observations =      108

                              Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1       Std
  0   3604.367     1.00000 |                    |********************|         0
  1   -137.562    -0.03817 |                .  *|   .                |  0.096225
  2   -534.599    -0.14832 |                .***|   .                |  0.096365
  3    532.370     0.14770 |                .   |***.                |  0.098456
  4   -333.965    -0.09266 |                . **|   .                |  0.100487
  5  18.297448     0.00508 |                .   |   .                |  0.101275
  6    307.097     0.08520 |                .   |** .                |  0.101277
  7   -564.094    -0.15650 |                .***|   .                |  0.101939
  8   -353.956    -0.09820 |                . **|   .                |  0.104140
  9  90.994829     0.02525 |                .   |*  .                |  0.104994
 10   -323.012    -0.08962 |                . **|   .                |  0.105050
 11 -46.680587    -0.01295 |                .   |   .                |  0.105755
 12   -185.238    -0.05139 |                .  *|   .                |  0.105770
 13   -226.586    -0.06286 |                .  *|   .                |  0.106001
 14    247.920     0.06878 |                .   |*  .                |  0.106346
 15   -522.192    -0.14488 |                .***|   .                |  0.106757
 16    221.711     0.06151 |                .   |*  .                |  0.108562
 17    456.417     0.12663 |                .   |***.                |  0.108884
 18 -98.975527    -0.02746 |                .  *|   .                |  0.110239
 19 -61.258667    -0.01700 |                .   |   .                |  0.110303
 20  33.052486     0.00917 |                .   |   .                |  0.110327
 21   -149.521    -0.04148 |                .  *|   .                |  0.110334
 22    132.129     0.03666 |                .   |*  .                |  0.110478
 23   -251.541    -0.06979 |                .  *|   .                |  0.110591
 24   -290.847    -0.08069 |                . **|   .                |  0.110998
                                    "." marks two standard errors

                         Inverse Autocorrelations

           Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
             1     0.03940 |                .   |*  .                |
             2     0.21266 |                .   |****                |
             3    -0.02549 |                .  *|   .                |
             4     0.15251 |                .   |***.                |
             5     0.03139 |                .   |*  .                |
             6     0.03106 |                .   |*  .                |
             7     0.13985 |                .   |***.                |
             8     0.19980 |                .   |****                |
             9     0.04817 |                .   |*  .                |
            10     0.09784 |                .   |** .                |
            11     0.13346 |                .   |***.                |
            12     0.08798 |                .   |** .                |
            13     0.13552 |                .   |***.                |
            14    -0.00488 |                .   |   .                |
            15     0.20078 |                .   |****                |
            16    -0.02991 |                .  *|   .                |
            17    -0.00376 |                .   |   .                |
            18    -0.01672 |                .   |   .                |
            19     0.08769 |                .   |** .                |
            20     0.02839 |                .   |*  .                |
            21     0.06149 |                .   |*  .                |
            22     0.03302 |                .   |*  .                |
            23     0.11815 |                .   |** .                |
            24     0.03581 |                .   |*  .                |
```

```
                       Partial Autocorrelations

 Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
   1    -0.03817 |                    .  *|  .                  |
   2    -0.14999 |                    .***|  .                  |
   3     0.13879 |                    .   |***.                 |
   4    -0.10999 |                    . **|  .                  |
   5     0.04648 |                    .   |*  .                 |
   6     0.03616 |                    .   |*  .                 |
   7    -0.12615 |                    .***|  .                  |
   8    -0.10446 |                    . **|  .                  |
   9    -0.03515 |                    .  *|  .                  |
  10    -0.07850 |                    . **|  .                  |
  11    -0.02085 |                    .   |  .                  |
  12    -0.09967 |                    . **|  .                  |
  13    -0.03654 |                    .  *|  .                  |
  14     0.02496 |                    .   |  .                  |
  15    -0.18751 |                   ****|  .                   |
  16     0.07247 |                    .   |*  .                 |
  17     0.03771 |                    .   |*  .                 |
  18     0.02923 |                    .   |*  .                 |
  19    -0.06376 |                    .  *|  .                  |
  20    -0.04276 |                    .  *|  .                  |
  21    -0.03193 |                    .  *|  .                  |
  22    -0.01921 |                    .   |  .                  |
  23    -0.14222 |                    .***|  .                  |
  24    -0.04363 |                    .  *|  .                  |


                Autocorrelation Check for White Noise

  To   Chi                       Autocorrelations
 Lag  Square DF   Prob
   6    6.92  6  0.328 -0.038 -0.148  0.148 -0.093  0.005  0.085
  12   12.35 12  0.418 -0.157 -0.098  0.025 -0.090 -0.013 -0.051
  18   18.80 18  0.404 -0.063  0.069 -0.145  0.062  0.127 -0.027
  24   20.88 24  0.646 -0.017  0.009 -0.041  0.037 -0.070 -0.081
```

Coalition G

```
                              ARIMA Procedure


                      Name of variable = NWLBWR.

                      Mean of working series = 85.15552
                      Standard deviation     = 103.3632
                      Number of observations =      108

                              Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1         Std
  0  10683.958     1.00000  |                    |********************|          0
  1  -1054.017    -0.09865  |               . **|   .                |   0.096225
  2    407.764     0.03817  |               .   |*  .                |   0.097157
  3    211.006     0.01975  |               .   |   .                |   0.097296
  4    387.860     0.03630  |               .   |*  .                |   0.097333
  5   -765.734    -0.07167  |               .  *|   .                |   0.097458
  6    302.700     0.02833  |               .   |*  .                |   0.097945
  7    218.692     0.02047  |               .   |   .                |   0.098021
  8    538.538     0.05041  |               .   |*  .                |   0.098060
  9   -122.835    -0.01150  |               .   |   .                |   0.098300
 10   -456.811    -0.04276  |               .  *|   .                |   0.098312
 11    239.973     0.02246  |               .   |   .                |   0.098485
 12    459.258     0.04299  |               .   |*  .                |   0.098532
 13  -1828.634    -0.17116  |               .***|   .                |   0.098705
 14   -956.945    -0.08957  |               . **|   .                |   0.101416
 15 -69.115948    -0.00647  |               .   |   .                |   0.102146
 16   -505.959    -0.04736  |               .  *|   .                |   0.102150
 17    686.912     0.06429  |               .   |*  .                |   0.102353
 18    355.175     0.03324  |               .   |*  .                |   0.102726
 19    539.987     0.05054  |               .   |*  .                |   0.102826
 20  -1163.575    -0.10891  |               . **|   .                |   0.103056
 21   1545.130     0.14462  |               .   |***.                |   0.104116
 22   -253.310    -0.02371  |               .   |   .                |   0.105960
 23   -151.460    -0.01418  |               .   |   .                |   0.106009
 24    222.110     0.02079  |               .   |   .                |   0.106026
                                     "." marks two standard errors


                          Inverse Autocorrelations

            Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
              1     0.09934  |               .   |** .                |
              2    -0.06497  |               .  *|   .                |
              3    -0.04347  |               .  *|   .                |
              4    -0.00783  |               .   |   .                |
              5     0.05072  |               .   |*  .                |
              6    -0.04112  |               .  *|   .                |
              7    -0.07957  |               . **|   .                |
              8    -0.10388  |               . **|   .                |
              9     0.03313  |               .   |*  .                |
             10     0.07731  |               .   |** .                |
             11    -0.04710  |               .  *|   .                |
             12    -0.05472  |               .  *|   .                |
             13     0.17348  |               .   |***.                |
             14     0.13633  |               .   |***.                |
             15     0.05334  |               .   |*  .                |
             16    -0.00404  |               .   |   .                |
             17    -0.08295  |               . **|   .                |
             18    -0.03216  |               .  *|   .                |
             19    -0.01156  |               .   |   .                |
             20     0.06298  |               .   |*  .                |
             21    -0.13833  |               .***|   .                |
             22    -0.02501  |               .  *|   .                |
             23     0.03470  |               .   |*  .                |
             24    -0.00827  |               .   |   .                |
```

```
                    Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1    -0.09865 |               . **|   .               |
  2     0.02871 |               .   |*  .               |
  3     0.02652 |               .   |*  .               |
  4     0.04008 |               .   |*  .               |
  5    -0.06678 |               .  *|   .               |
  6     0.01206 |               .   |   .               |
  7     0.02776 |               .   |*  .               |
  8     0.05697 |               .   |*  .               |
  9     0.00046 |               .   |   .               |
 10    -0.05643 |               .  *|   .               |
 11     0.01183 |               .   |   .               |
 12     0.05159 |               .   |*  .               |
 13    -0.15806 |               .***|   .               |
 14    -0.13235 |               .***|   .               |
 15    -0.02933 |               .  *|   .               |
 16    -0.03390 |               .  *|   .               |
 17     0.08670 |               .   |** .               |
 18     0.04070 |               .   |*  .               |
 19     0.04598 |               .   |*  .               |
 20    -0.10266 |               . **|   .               |
 21     0.14702 |               .   |***.               |
 22     0.03738 |               .   |*  .               |
 23    -0.04117 |               .  *|   .               |
 24     0.00936 |               .   |   .               |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	2.12	6	0.908	-0.099	0.038	0.020	0.036	-0.072	0.028
12	3.00	12	0.996	0.020	0.050	-0.011	-0.043	0.022	0.043
18	8.66	18	0.967	-0.171	-0.090	-0.006	-0.047	0.064	0.033
24	13.63	24	0.955	0.051	-0.109	0.145	-0.024	-0.014	0.021

Coalition H

```
                              ARIMA Procedure

                    Name of variable = NWLBWR.

                    Mean of working series =  125.636
                    Standard deviation     =  156.191
                    Number of observations =      108

                              Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1      Std
  0  24395.640    1.00000  |                    |********************|         0
  1   1159.111    0.04751  |                .   |*  .                |  0.096225
  2   3493.281    0.14319  |                .   |***.                |  0.096442
  3   1896.142    0.07772  |                .   |** .                |  0.098391
  4   -994.407   -0.04076  |                .  *|   .                |  0.098958
  5    282.992    0.01160  |                .   |   .                |  0.099113
  6   1739.940    0.07132  |                .   |*  .                |  0.099126
  7   3203.395    0.13131  |                .   |***.                |  0.099600
  8   4184.120    0.17151  |                .   |***.                |  0.101190
  9    444.229    0.01821  |                .   |   .                |  0.103847
 10   4105.722    0.16830  |                .   |***.                |  0.103876
 11   2225.978    0.09124  |                .   |** .                |  0.106371
 12   3454.695    0.14161  |                .   |***.                |  0.107093
 13   1231.302    0.05047  |                .   |*  .                |  0.108813
 14    506.387    0.02076  |                .   |   .                |  0.109030
 15   -771.780   -0.03164  |                .  *|   .                |  0.109067
 16  -3215.565   -0.13181  |                .***|   .                |  0.109151
 17  -2535.040   -0.10391  |                . **|   .                |  0.110615
 18   -821.440   -0.03367  |                .  *|   .                |  0.111516
 19   2105.255    0.08630  |                .   |** .                |  0.111610
 20   -109.619   -0.00449  |                .   |   .                |  0.112226
 21   2100.232    0.08609  |                .   |** .                |  0.112228
 22  -2010.264   -0.08240  |               .  **|    .               |  0.112837
 23    119.916    0.00492  |               .    |    .               |  0.113393
 24  -3191.340   -0.13082  |               . ***|    .               |  0.113395
                                  "." marks two standard errors

                          Inverse Autocorrelations

           Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
             1    0.08649  |                .   |** .                |
             2    0.00005  |                .   |   .                |
             3   -0.06254  |                .  *|   .                |
             4    0.12374  |                .   |** .                |
             5    0.03529  |                .   |*  .                |
             6   -0.10086  |                . **|   .                |
             7   -0.15253  |                .***|   .                |
             8   -0.17347  |                .***|   .                |
             9   -0.00326  |                .   |   .                |
            10   -0.19109  |                ****|   .                |
            11   -0.07585  |                . **|   .                |
            12   -0.13805  |                .***|   .                |
            13    0.01101  |                .   |   .                |
            14   -0.04593  |                .  *|   .                |
            15    0.02302  |                .   |   .                |
            16    0.12064  |                .   |** .                |
            17    0.11536  |                .   |** .                |
            18    0.07414  |                .   |*  .                |
            19   -0.06268  |                .  *|   .                |
            20    0.05712  |                .   |*  .                |
            21   -0.02242  |                .   |   .                |
            22    0.08695  |                .   |** .                |
            23   -0.04526  |                .  *|   .                |
            24    0.04809  |                .   |*  .                |
```

```
                     Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.04751  |               .   |*  .               |
  2     0.14125  |               .   |***.               |
  3     0.06665  |               .   |*  .               |
  4    -0.06801  |               .  *|   .               |
  5    -0.00522  |               .   |   .               |
  6     0.08412  |               .   |** .               |
  7     0.13821  |               .   |***.               |
  8     0.14531  |               .   |***.               |
  9    -0.04155  |               .  *|   .               |
 10     0.11985  |               .   |** .               |
 11     0.09256  |               .   |** .               |
 12     0.13429  |               .   |***.               |
 13    -0.00737  |               .   |   .               |
 14    -0.04756  |               .  *|   .               |
 15    -0.08109  |               . **|   .               |
 16    -0.16154  |               .***|   .               |
 17    -0.14431  |               .***|   .               |
 18    -0.09862  |               . **|   .               |
 19     0.06423  |               .   |*  .               |
 20    -0.07188  |               .  *|   .               |
 21     0.03691  |               .   |*  .               |
 22    -0.12053  |               . **|   .               |
 23     0.05978  |               .   |*  .               |
 24    -0.05911  |               .  *|   .               |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	4.03	6	0.673	0.048	0.143	0.078	-0.041	0.012	0.071
12	16.53	12	0.168	0.131	0.172	0.018	0.168	0.091	0.142
18	20.83	18	0.288	0.050	0.021	-0.032	-0.132	-0.104	-0.034
24	26.20	24	0.343	0.086	-0.004	0.086	-0.082	0.005	-0.131

Coalition I

ARIMA Procedure

```
Name of variable = NWLBWR.

Mean of working series = 104.0688
Standard deviation     = 91.16269
Number of observations =      108
```

Autocorrelations

```
Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1          Std
  0   8310.636    1.00000  |                    |********************|           0
  1  -1486.910   -0.17892  |                ****|   .                |    0.096225
  2   -743.329   -0.08944  |                . **|   .                |    0.099258
  3    915.298    0.11014  |                .   |** .                |    0.100001
  4    414.276    0.04985  |                .   |*  .                |    0.101118
  5   -552.877   -0.06653  |                .  *|   .                |    0.101345
  6  -1182.523   -0.14229  |                .***|   .                |    0.101749
  7    130.274    0.01568  |                .   |   .                |    0.103575
  8 -29.521464   -0.00355  |                .   |   .                |    0.103597
  9    476.984    0.05739  |                .   |*  .                |    0.103598
 10  -1168.497   -0.14060  |                .***|   .                |    0.103892
 11    929.345    0.11183  |                .   |** .                |    0.105639
 12    525.490    0.06323  |                .   |*  .                |    0.106730
 13  57.887536    0.00697  |                .   |   .                |    0.107076
 14    181.686    0.02186  |                .   |   .                |    0.107080
 15   -163.210   -0.01964  |                .   |   .                |    0.107121
 16   -203.740   -0.02452  |                .   |   .                |    0.107155
 17   -233.465   -0.02809  |                .  *|   .                |    0.107207
 18    957.180    0.11518  |                .   |** .                |    0.107275
 19   -976.436   -0.11749  |                . **|   .                |    0.108414
 20    494.188    0.05946  |                .   |*  .                |    0.109586
 21 -21.926955   -0.00264  |                .   |   .                |    0.109885
 22  30.417932    0.00366  |                .   |   .                |    0.109885
 23    461.848    0.05557  |                .   |*  .                |    0.109886
 24   -395.238   -0.04756  |                .  *|   .                |    0.110146
                                     "." marks two standard errors
```

Inverse Autocorrelations

```
Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1    0.19230  |                .   |****                |
  2    0.02865  |                .   |*  .                |
  3   -0.15374  |                .***|   .                |
  4   -0.02467  |                .   |   .                |
  5    0.11227  |                .   |** .                |
  6    0.15589  |                .   |***.                |
  7    0.01115  |                .   |   .                |
  8   -0.01075  |                .   |   .                |
  9    0.00067  |                .   |   .                |
 10    0.09536  |                .   |** .                |
 11   -0.06541  |                .  *|   .                |
 12   -0.11201  |                . **|   .                |
 13   -0.09316  |                . **|   .                |
 14   -0.00211  |                .   |   .                |
 15    0.07086  |                .   |*  .                |
 16    0.03921  |                .   |*  .                |
 17   -0.03208  |                .  *|   .                |
 18   -0.12432  |                . **|   .                |
 19    0.02362  |                .   |   .                |
 20   -0.01757  |                .   |   .                |
 21    0.01240  |                .   |   .                |
 22   -0.02037  |                .   |   .                |
 23   -0.05410  |                .  *|   .                |
 24    0.00181  |                .   |   .                |
```

Partial Autocorrelations

```
Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1   -0.17892   |               ****|   .               |
  2   -0.12547   |               .***|   .               |
  3    0.07313   |               .   |*  .               |
  4    0.07829   |               .   |** .               |
  5   -0.02498   |               .   |   .               |
  6   -0.16753   |               .***|   .               |
  7   -0.07104   |               .  *|   .               |
  8   -0.03455   |               .  *|   .               |
  9    0.09594   |               .   |** .               |
 10   -0.10180   |               . **|   .               |
 11    0.06648   |               .   |*  .               |
 12    0.03680   |               .   |*  .               |
 13    0.05989   |               .   |*  .               |
 14    0.04393   |               .   |*  .               |
 15   -0.01978   |               .   |   .               |
 16   -0.07354   |               .  *|   .               |
 17   -0.03037   |               .  *|   .               |
 18    0.13588   |               .   |***.               |
 19   -0.02854   |               .  *|   .               |
 20    0.04544   |               .   |*  .               |
 21   -0.02890   |               .  *|   .               |
 22   -0.00060   |               .   |   .               |
 23    0.06415   |               .   |*  .               |
 24   -0.00212   |               .   |   .               |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	8.98	6	0.175	-0.179	-0.089	0.110	0.050	-0.067	-0.142
12	13.82	12	0.312	0.016	-0.004	0.057	-0.141	0.112	0.063
18	15.87	18	0.602	0.007	0.022	-0.020	-0.025	-0.028	0.115
24	18.95	24	0.755	-0.117	0.059	-0.003	0.004	0.056	-0.048

Coalition J

```
                              ARIMA Procedure

                   Name of variable = NWLBWR.

                   Mean of working series = 126.7193
                   Standard deviation     = 67.70748
                   Number of observations =      108

                              Autocorrelations

Lag Covariance Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1        Std
  0   4584.302    1.00000  |                    |********************|          0
  1    223.191    0.04869  |               .    |*  .                |   0.096225
  2    578.815    0.12626  |               .    |***.                |   0.096453
  3    356.125    0.07768  |               .    |** .                |   0.097971
  4  78.405804    0.01710  |               .    |   .                |   0.098540
  5   -300.456   -0.06554  |               .   *|   .                |   0.098567
  6  37.058622    0.00808  |               .    |   .                |   0.098970
  7   -200.500   -0.04374  |               .   *|   .                |   0.098976
  8   -227.112   -0.04954  |               .   *|   .                |   0.099155
  9   -237.928   -0.05190  |               .   *|   .                |   0.099384
 10   -234.597   -0.05117  |               .   *|   .                |   0.099635
 11   -245.218   -0.05349  |               .   *|   .                |   0.099878
 12 -15.767345   -0.00344  |               .    |   .                |   0.100143
 13 -61.206126   -0.01335  |               .    |   .                |   0.100144
 14   -184.781   -0.04031  |               .   *|   .                |   0.100160
 15    863.858    0.18844  |               .    |****                |   0.100310
 16   -216.567   -0.04724  |               .   *|   .                |   0.103536
 17    392.247    0.08556  |               .    |** .                |   0.103735
 18   -363.315   -0.07925  |               .  **|   .                |   0.104387
 19    350.397    0.07643  |               .    |** .                |   0.104943
 20   -563.795   -0.12298  |               .  **|   .                |   0.105457
 21    582.679    0.12710  |               .    |***.                |   0.106776
 22   -168.195   -0.03669  |               .   *|   .                |   0.108168
 23    400.726    0.08741  |               .    |** .                |   0.108283
 24 -33.302294   -0.00726  |               .    |   .                |   0.108935
                                  "." marks two standard errors


                        Inverse Autocorrelations

            Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
              1   -0.14315  |               .***|   .                |
              2    0.01810  |               .   |   .                |
              3   -0.17795  |               ****|   .                |
              4    0.07337  |               .   |*  .                |
              5   -0.01451  |               .   |   .                |
              6    0.03506  |               .   |*  .                |
              7   -0.01625  |               .   |   .                |
              8    0.03729  |               .   |*  .                |
              9    0.03806  |               .   |*  .                |
             10    0.00003  |               .   |   .                |
             11    0.02785  |               .   |*  .                |
             12   -0.00095  |               .   |   .                |
             13    0.02236  |               .   |   .                |
             14    0.04827  |               .   |*  .                |
             15   -0.18125  |               ****|   .                |
             16    0.05722  |               .   |*  .                |
             17   -0.08143  |               . **|   .                |
             18    0.12212  |               .   |** .                |
             19   -0.07661  |               . **|   .                |
             20    0.13417  |               .   |***.                |
             21   -0.12246  |               . **|   .                |
             22    0.04537  |               .   |*  .                |
             23   -0.08865  |               . **|   .                |
             24    0.02243  |               .   |   .                |
```

```
                     Partial Autocorrelations

Lag Correlation -1 9 8 7 6 5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 1
  1     0.04869  |               .   |*  .               |
  2     0.12418  |               .   |** .               |
  3     0.06745  |               .   |*  .               |
  4    -0.00425  |               .   |   .               |
  5    -0.08583  |               . **|   .               |
  6     0.00661  |               .   |   .               |
  7    -0.02707  |               .  *|   .               |
  8    -0.03832  |               .  *|   .               |
  9    -0.04112  |               .  *|   .               |
 10    -0.03853  |               .  *|   .               |
 11    -0.03170  |               .  *|   .               |
 12     0.01320  |               .   |   .               |
 13    -0.00139  |               .   |   .               |
 14    -0.04223  |               .  *|   .               |
 15     0.19153  |               .   |****               |
 16    -0.06314  |               .  *|   .               |
 17     0.04988  |               .   |*  .               |
 18    -0.11785  |               . **|   .               |
 19     0.07105  |               .   |*  .               |
 20    -0.10813  |               . **|   .               |
 21     0.13886  |               .   |***.               |
 22    -0.03583  |               .  *|   .               |
 23     0.09691  |               .   |** .               |
 24    -0.02582  |               .  *|   .               |
```

Autocorrelation Check for White Noise

To Lag	Chi Square	DF	Prob	Autocorrelations					
6	3.27	6	0.774	0.049	0.126	0.078	0.017	-0.066	0.008
12	4.78	12	0.965	-0.044	-0.050	-0.052	-0.051	-0.053	-0.003
18	11.61	18	0.866	-0.013	-0.040	0.188	-0.047	0.086	-0.079
24	17.90	24	0.808	0.076	-0.123	0.127	-0.037	0.087	-0.007

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BIOGRAPHICAL SKETCH

My interest in public administration and public policy was spurred early in my college career by the first political science courses I took in community college. From my freshman year, I knew that I wanted to work as a policy analyst in some fashion. While my first thought was to go into the intelligence field, the choice was made for me when the Berlin Wall fell and the end of the Cold War called into question any future as an analyst of Soviet and Eastern European affairs.

I then chose to look at other substantive policy areas including environmental and health policy. Although my first experience was working in the environmental policy field, I soon realized that my true passion was health policy.

After completing my doctoral qualifying exams, I began work at the North Central Florida Health Planning Council. Among my various responsibilities was serving as support staff for two of Florida's Healthy Start Coalitions. Because I already wanted to do my dissertation on a public health policy, the merger of the two became inevitable. While working for the council I made several contacts who have been indispensable resources for the data contained in this research.

With the completion of this work, I hope to continue to explore that relationship between public health policy implementation and outcomes. I hope that it will eventually shine light on our ability to help those people in need of government intervention. The goal truly is for healthy policy, healthy lives.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

David M. Hedge, Chairman
Professor of Political Science

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Michael J. Scicchitano
Associate Professor of Political Science

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the graduate Faculty of the Department of Political Science in the College of Liberal Arts and Sciences and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Dean, Graduate School